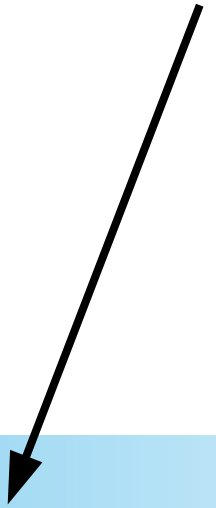
Home Automation with IoT

A POSTERIORI

Play · Experience · Learn

Before we start...

- We believe in open access to knowledge
- All our slides are shared online for free
- You can print it, share it, modify it, use it to run your own IoT companies...
- This current set of slides can be found here



About Us - A Posteriori

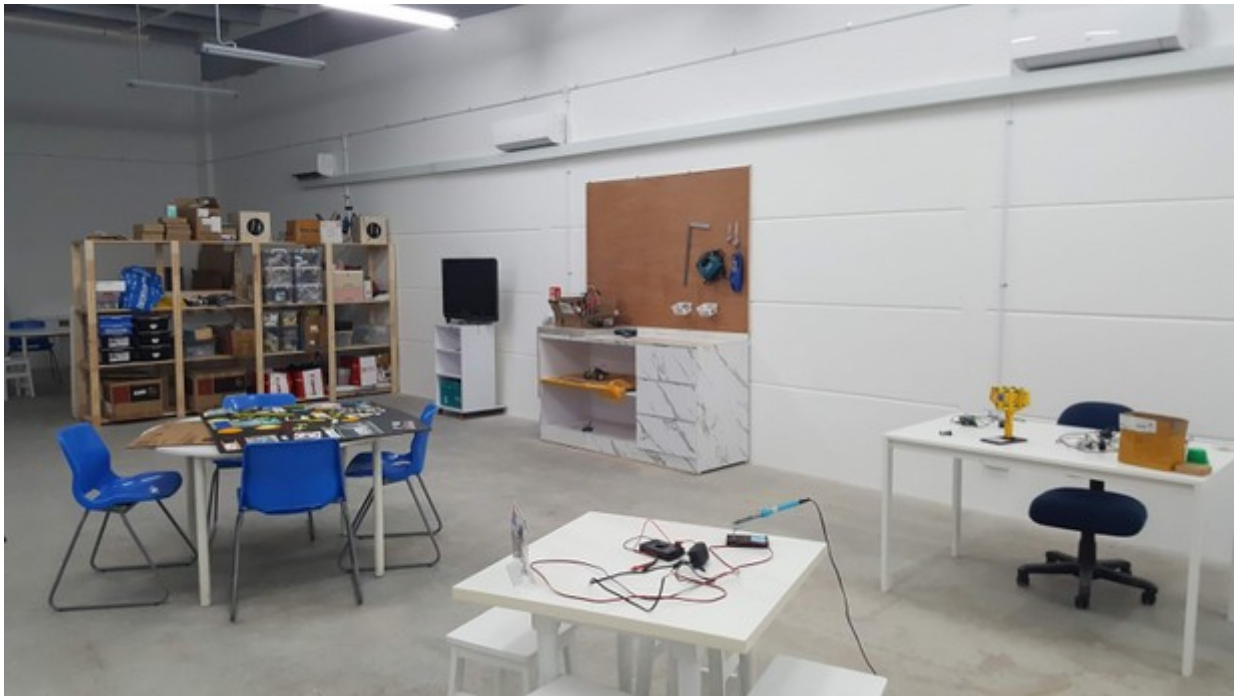
YONI
Spent 15 years developing software in the financial service industry, now developing the next generation of Makers and Coders.

CORT
Ex-Navy engineer managing big engines, powerful generators, and easily choked toilets. Codes and builds stuff because he's too cheap to buy

Our Company

Our Makerspace

- Suitable for electronics, 3D printing, woodwork, coding and tinkering
- Free for public use
- Located in MEGA @ Woodlands

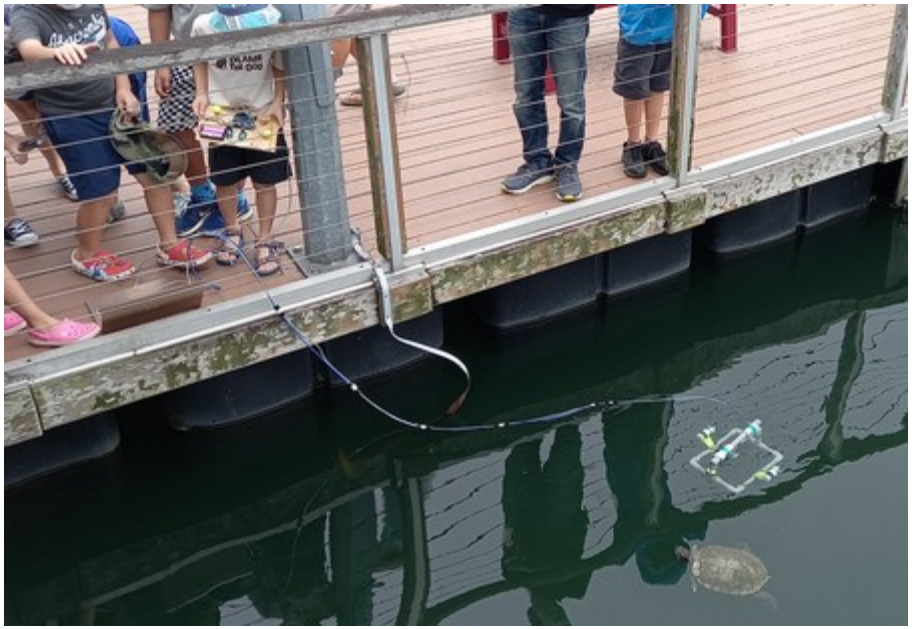


Our Programmes

- Competition Programs
  - Our team, Galaxy Raiders, participates in various national events, collecting trophies and medals...

Our Programmes

- Holiday Camps
  - Robotics, Apps creation, Coding, 3D Designs, Science and Research

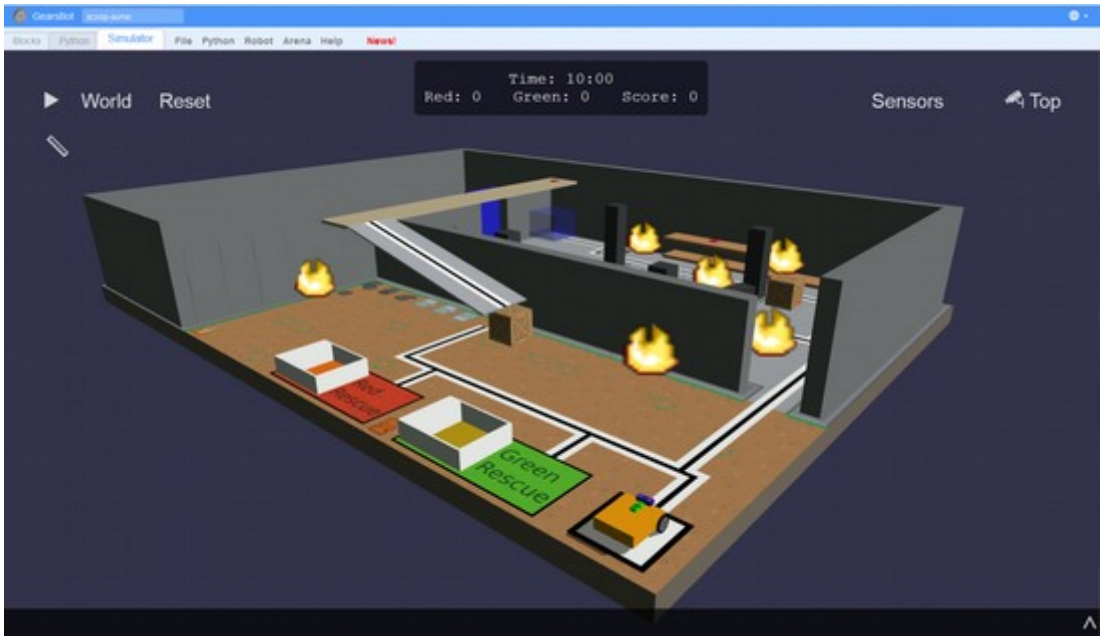


Our Programmes

- Regular Sessions
  - Virtual Coding/Robotics @ Home (over Zoom)
  - Interest-based, guided exploration

GearsBot

Cort's Cirtcuit-Breaker brain-child.



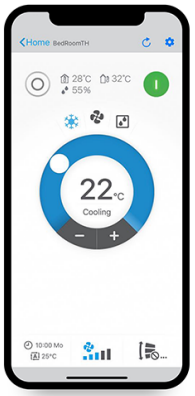
What is the Internet-of-Things (IoT)?

A POSTERIORI

Play · Experience · Learn

What is IoT?

Control lights through phone...

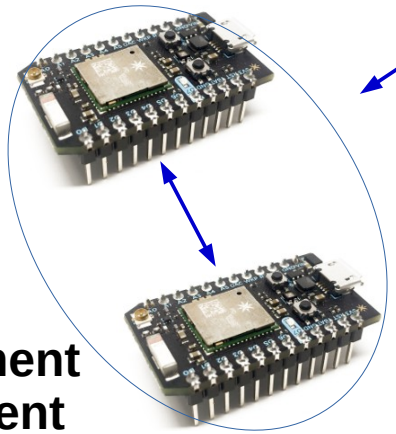


Turn on aircon before reaching home...

Toast your bread remotely (...we don't know why either)

- Make existing or new devices more useful by connecting them to the internet (eg. lights, aircon, door locks, burglar alarm)

How Does IoT Work?



Internet Server
- Store and Process

User Devices
- View and Control
- Typically phones or computers

IoT Devices
- Sense environment
- Control equipment

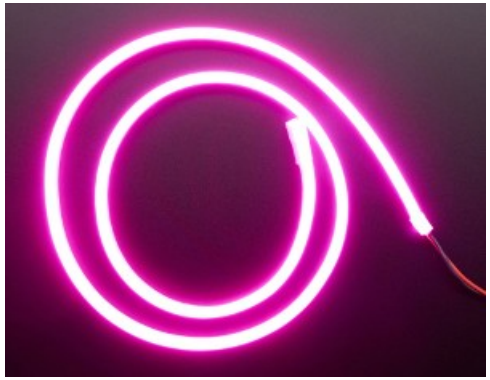
IoT in Industry

Notify vendor to top-up machine when empty

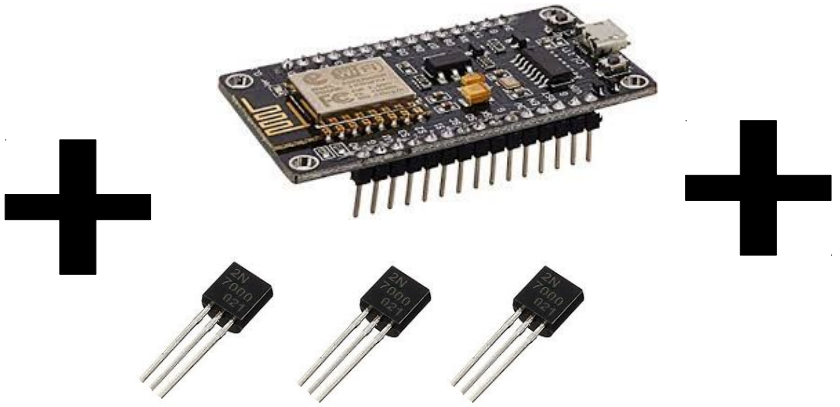
Track water and power usage

Arrange for garbage collection when bin is full

IoT Can Be Cheap & Easy!



LED Strips
($15 with power supply)



Controller and transistors ($10)

```
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>

char auth[] = "xxx";

char ssid[] = "HomeWifi";
char pass[] = "yyy";

void setup()
{
  Blynk.begin(auth, ssid, pass);
}

void loop()
{
  Blynk.run();
}
```

13 lines of code
(5 mins of your time)

Phone controllable
mood lighting

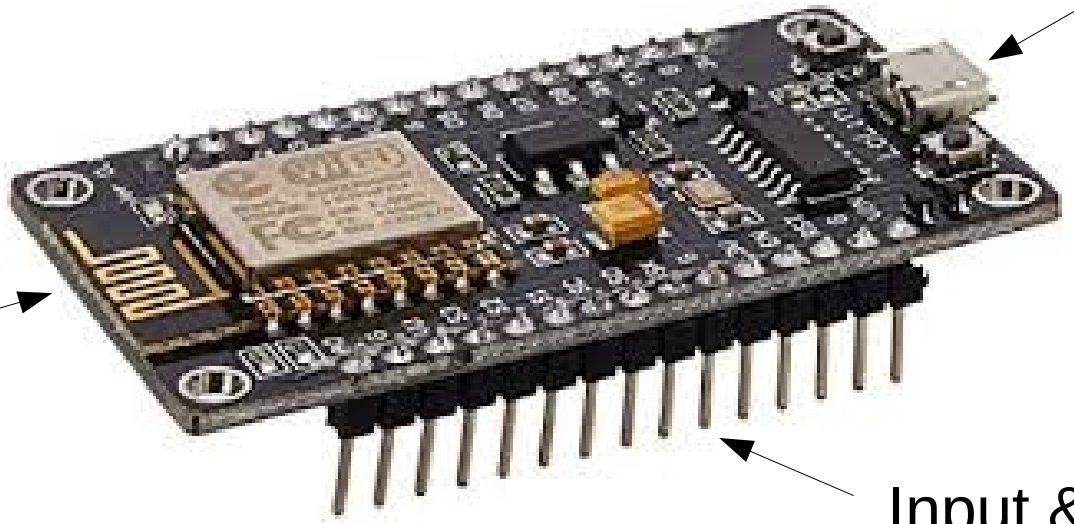
The ESP8266 (IoT Device)

A POSTERIORI

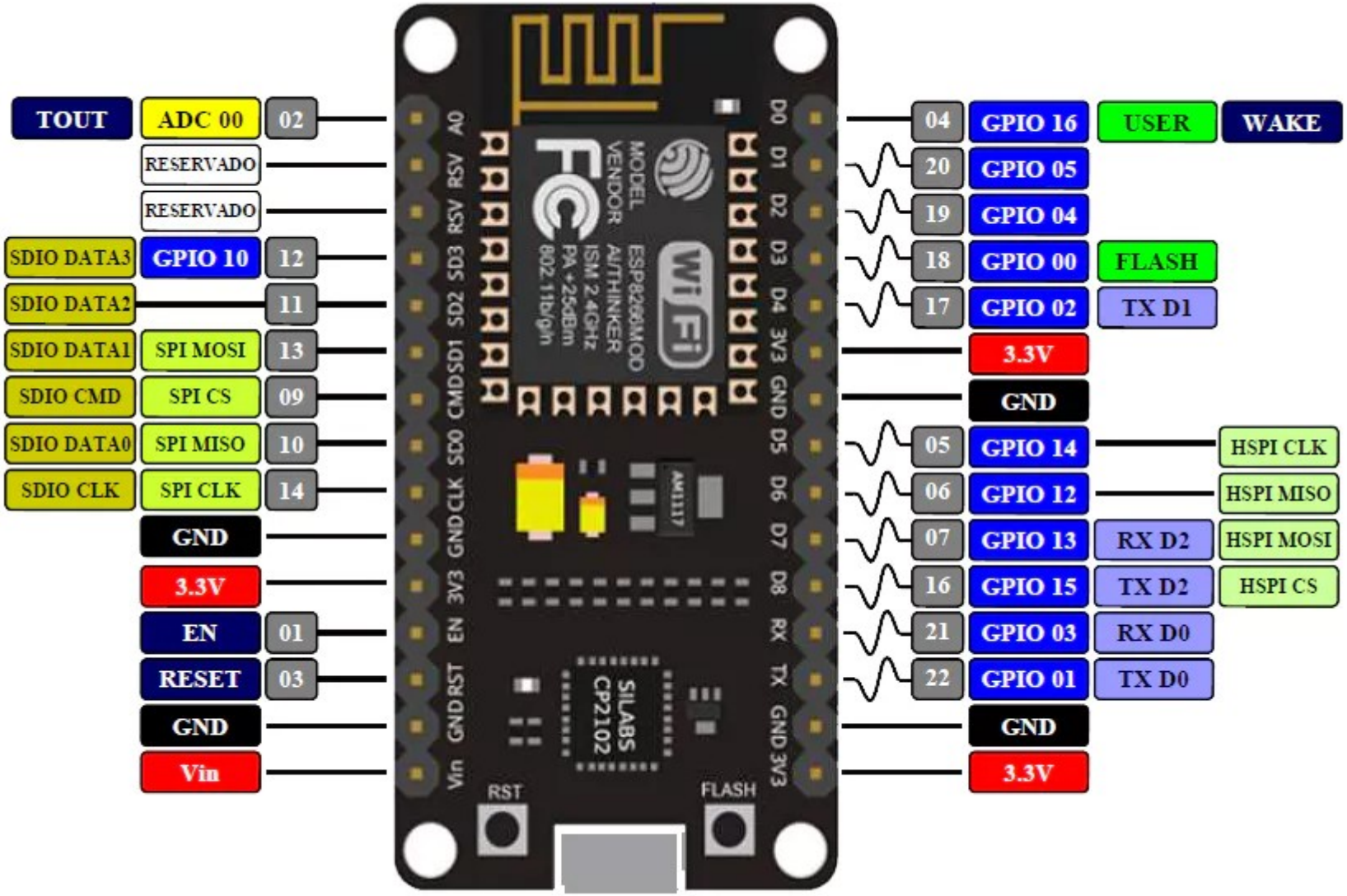
Play · Experience · Learn

What is the ESP8266?

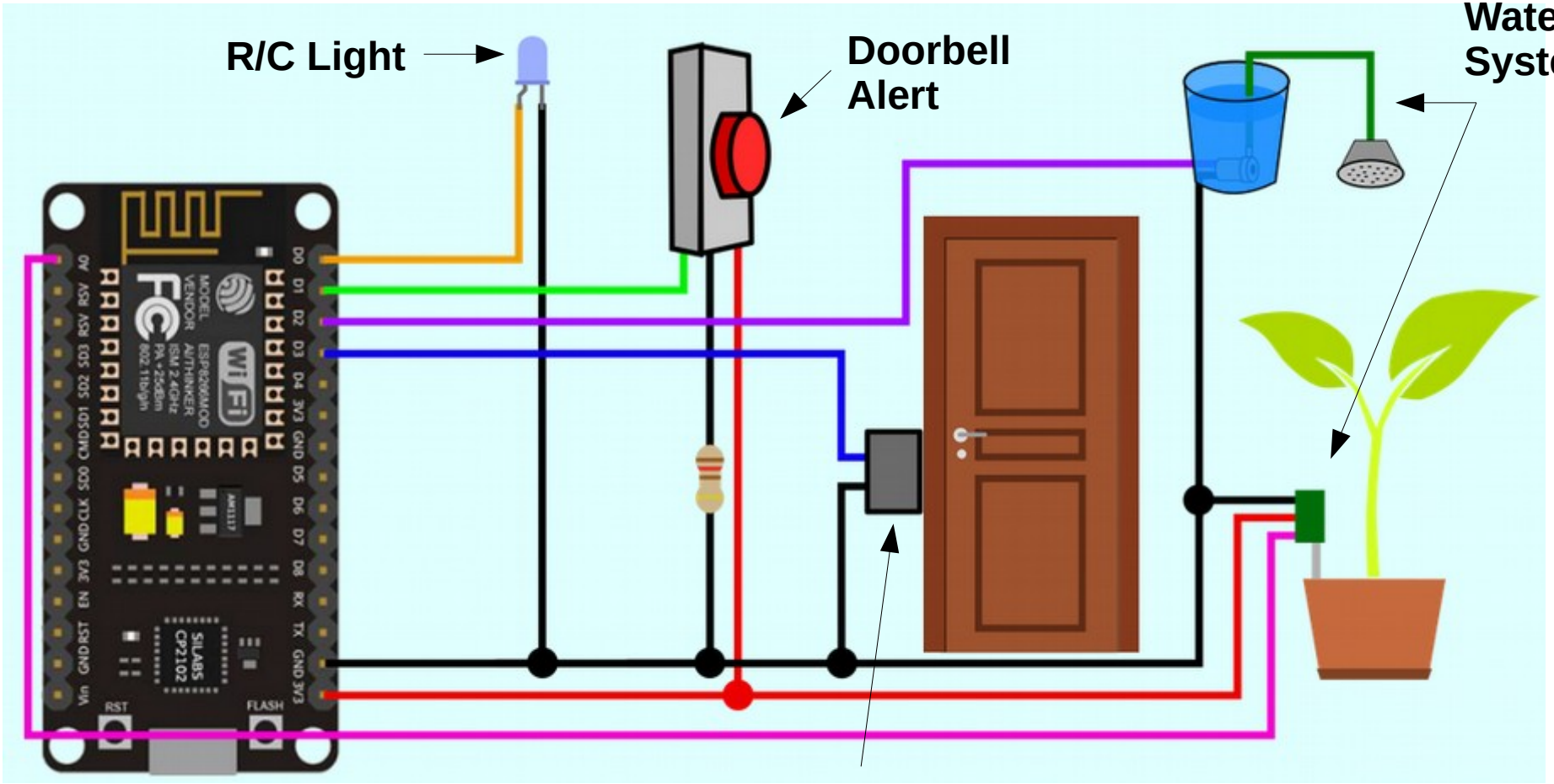
- Microcontroller (similar to Arduino and micro:bit)
- Built-in WiFi



Pinouts


TOUT
ADC 00
02
RESERVADO
RESERVADO
SDIO DATA3
GPIO 10
12
SDIO DATA2
11
SDIO DATA1
SPI MOSI
13
SDIO CMD
SPI CS
09
SDIO DATA0
SPI MISO
10
SDIO CLK
SPI CLK
14
GND
3.3V
EN
01
RESET
03
GND
Vin
A0
RSV
RSV
SD3
SD2
SD1
CMD
SD0
CLK
GND
3V3
EN
RST
GND
Vin
D0
D1
D2
D3
D4
3V3
GND
D5
D6
D7
D8
RX
TX
GND
3V3
MODEL
VENDOR
ESP8266MOD
AITHINKER
ISM 2.4GHz
PA +25dBm
802.11b/g/n
Wi Fi
AMS1117
SILABS
CP2102
RST
FLASH
04
GPIO 16
USER
WAKE
20
GPIO 05
19
GPIO 04
18
GPIO 00
FLASH
17
GPIO 02
TX D1
3.3V
GND
05
GPIO 14
HSPI CLK
06
GPIO 12
HSPI MISO
07
GPIO 13
RX D2
HSPI MOSI
16
GPIO 15
TX D2
HSPI CS
21
GPIO 03
RX D0
22
GPIO 01
TX D0
GND
3.3V

Introducing Our Virtual Home



http://a9i.sg/iot

A POSTERIORI

Play · Experience · Learn

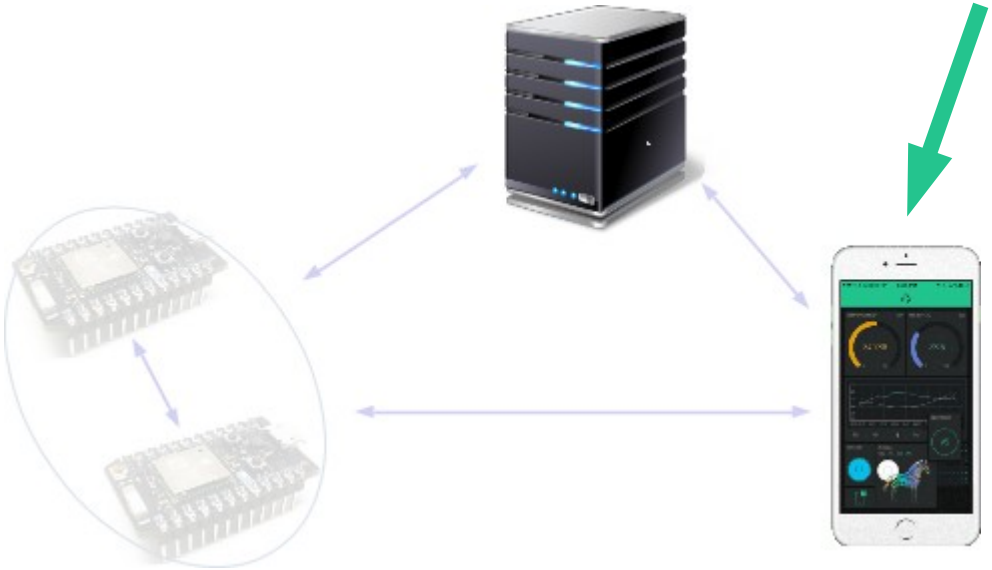
Easy IoT With Blynk

A POSTERIORI

Play · Experience · Learn

Blynk

Blynk provides the *server* and the *mobile app* for your IoT device.

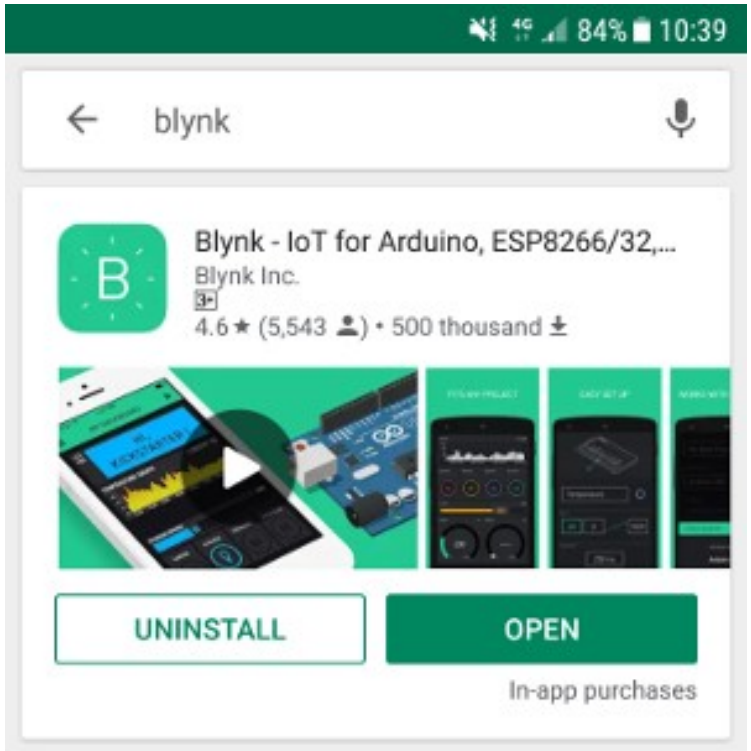


A POSTERIORI

Play · Experience · Learn

Blynk

- Install Blynk
- Available for iOS or Android
- Register and Login

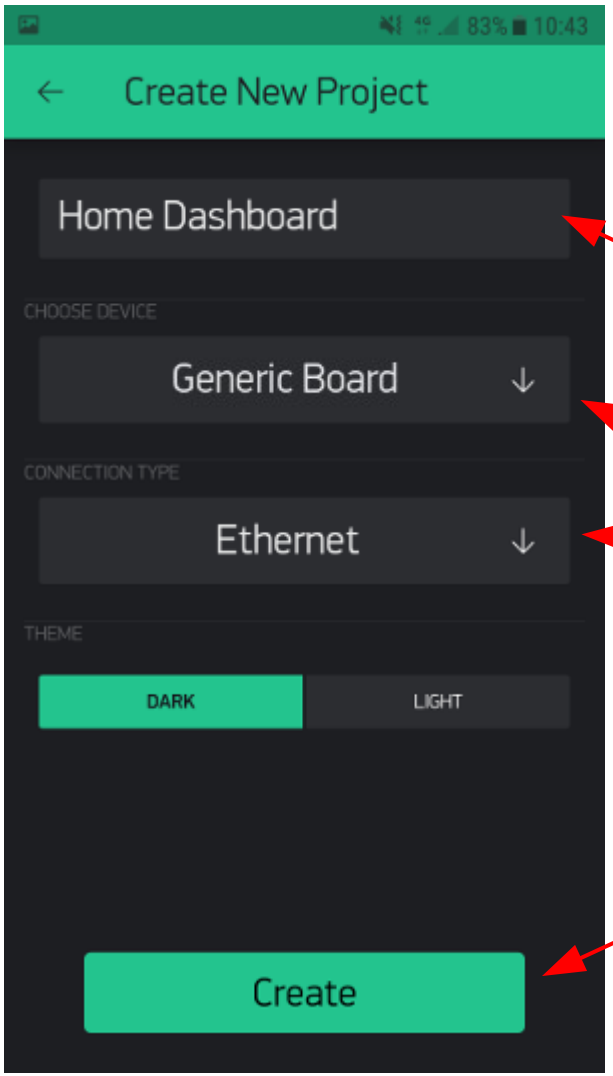


Challenge 1:
Connect your IoT Device

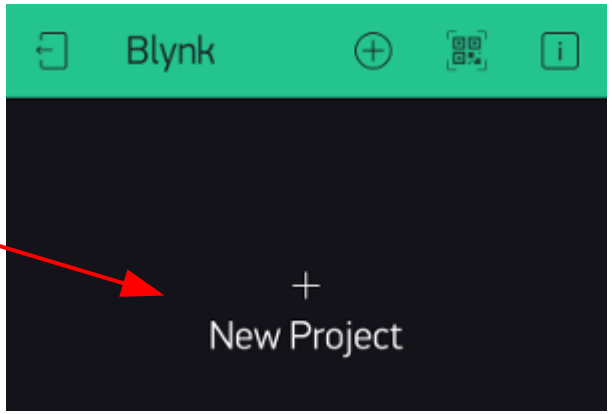
A POSTERIORI

Play · Experience · Learn

Challenge 1 : Connect IoT Device



Create a new project

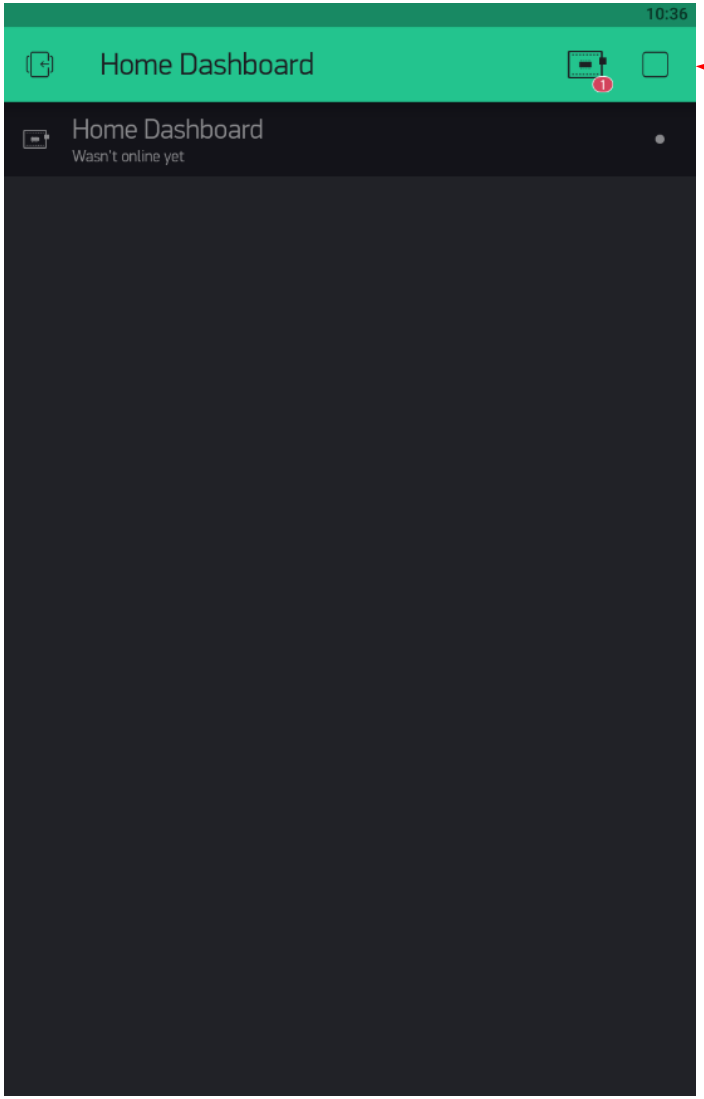


Choose Name

Set “Device” to “Generic Board” and “Connection Type” to “Ethernet”

Tap “Create” when you’re done

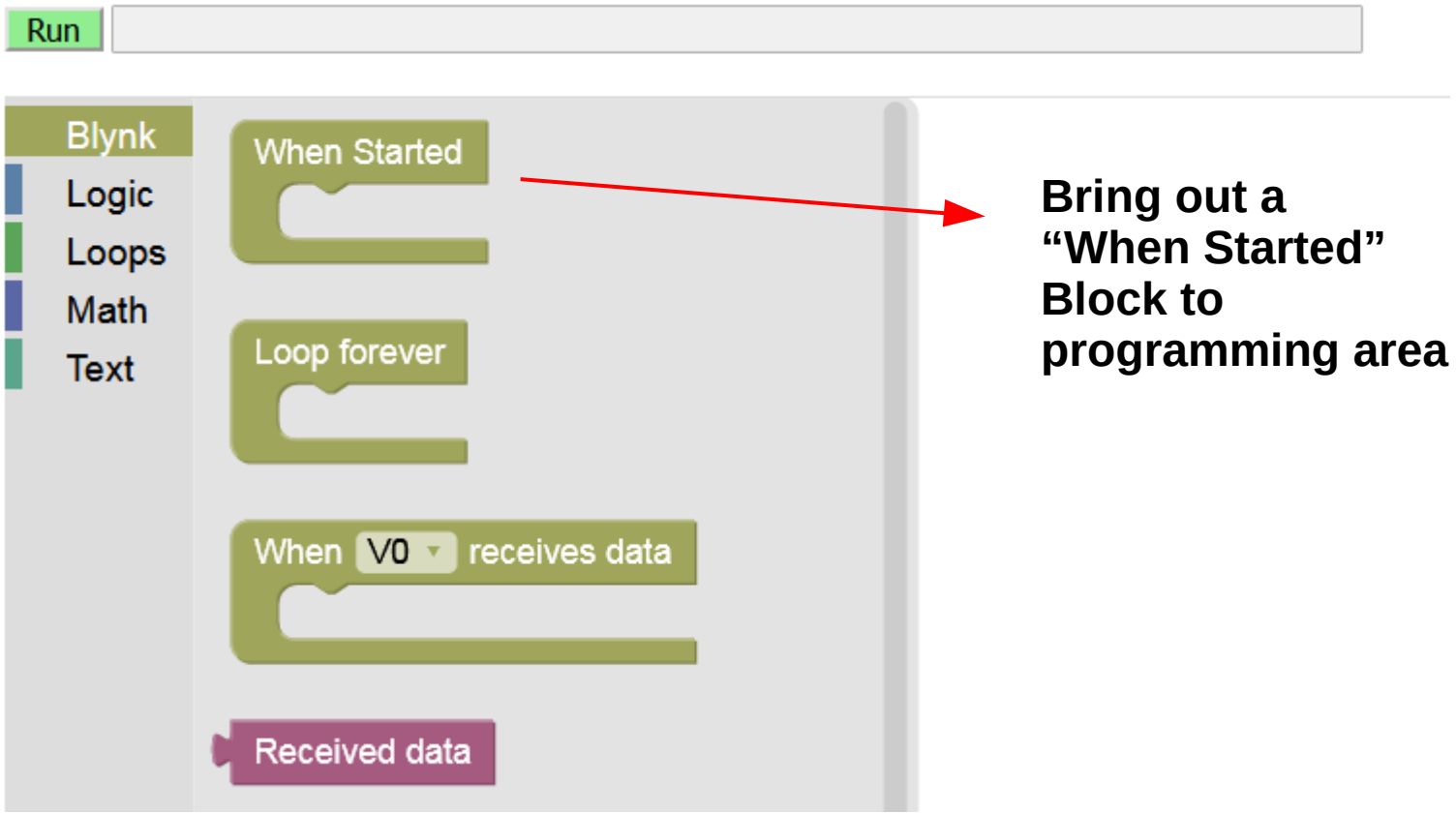
Challenge 1 : Connect IoT Device



Press Play

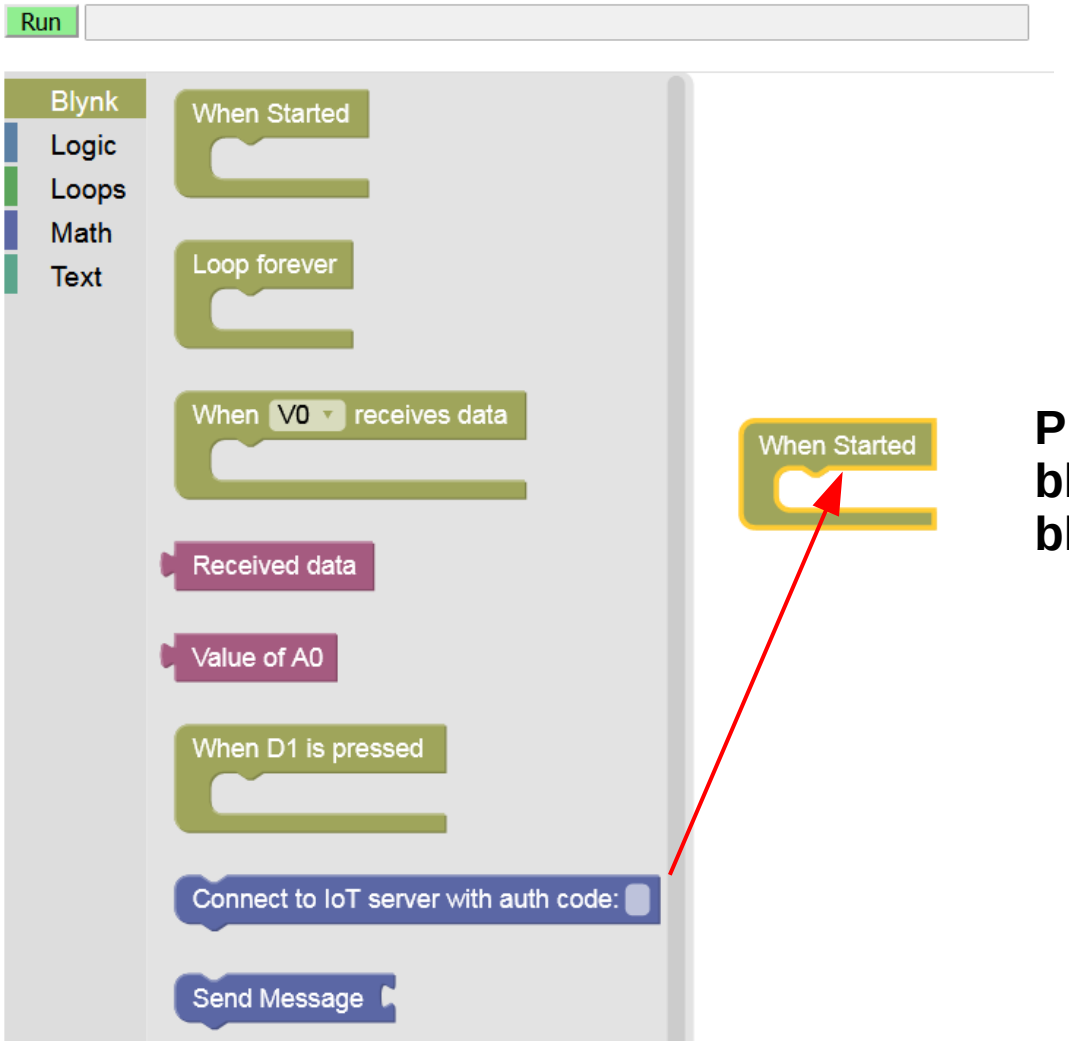
Click on Device icon
Should say: “Wasn’t online yet”

Challenge 1 : Connect IoT Device



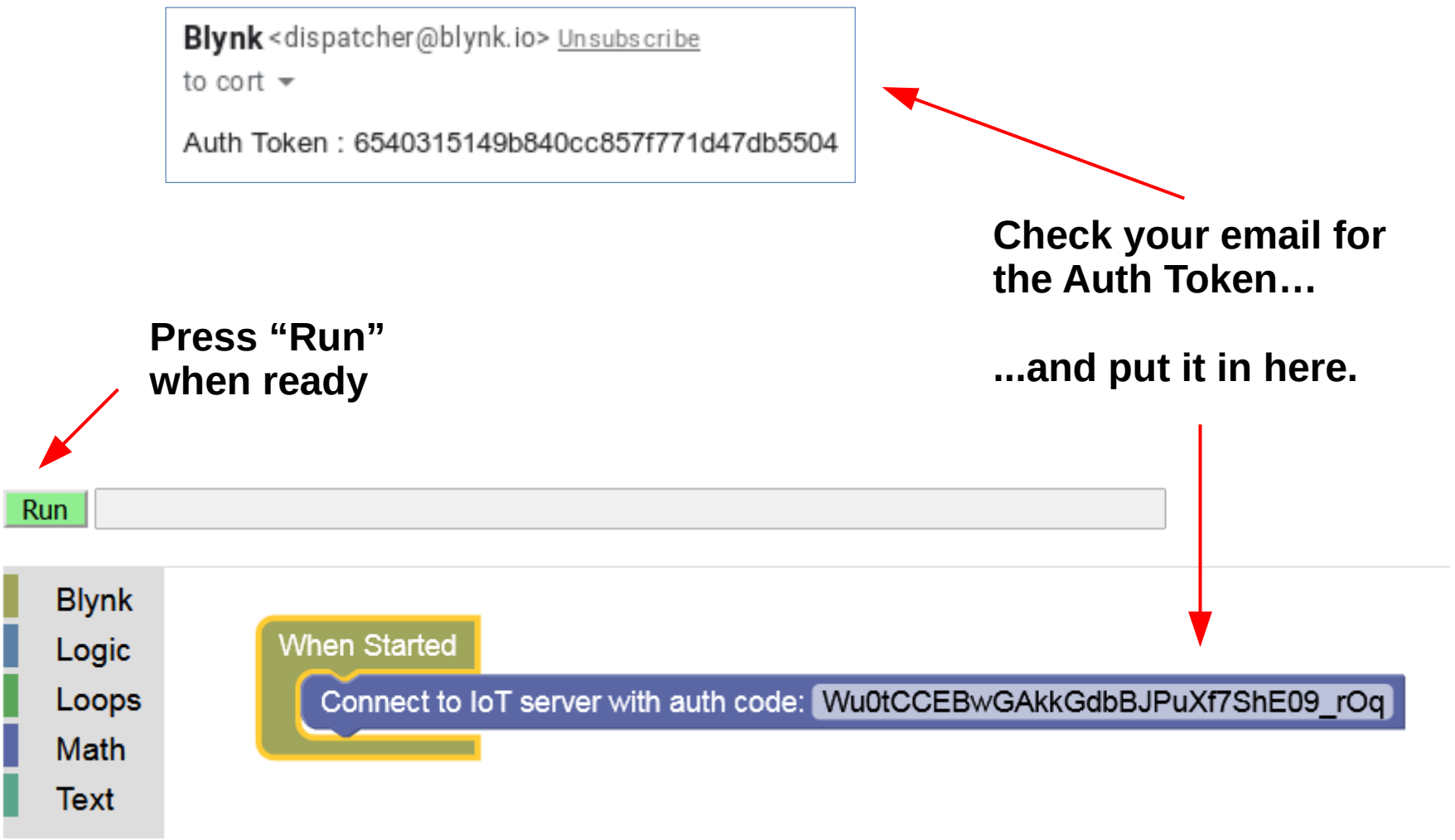
Bring out a "When Started" Block to programming area

Challenge 1 : Connect IoT Device

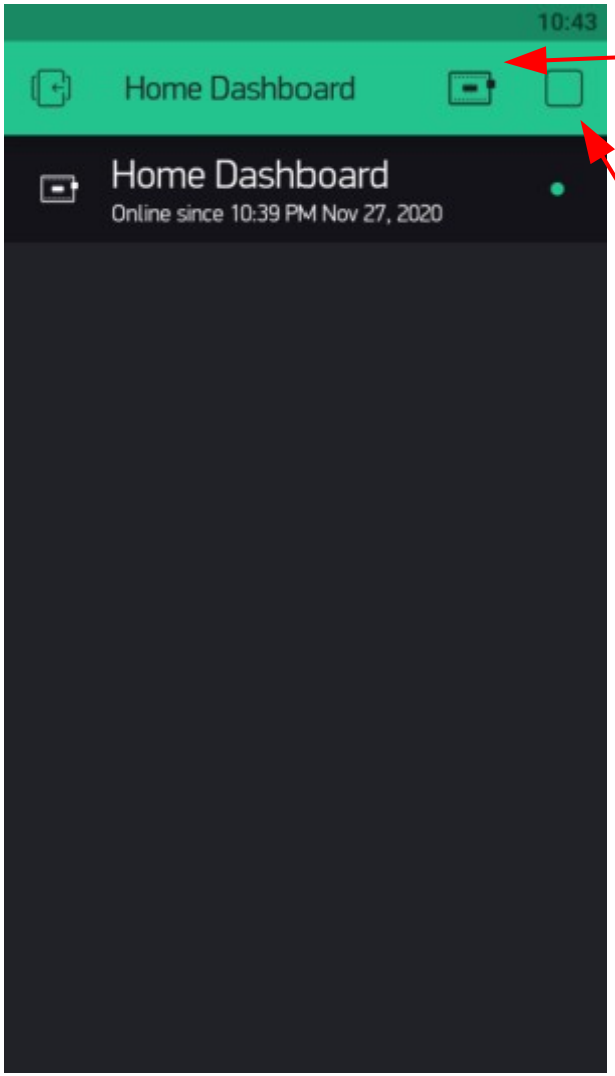


Place a “Connect to IoT Server” block inside the When Started block.

Challenge 1 : Connect IoT Device



Challenge 1 : Connect IoT Device



Warning icon should turn off

Click on Device icon
Should say: “Online since...”

CONGRATULATIONS!
You’ve Connected your first IoT Device.

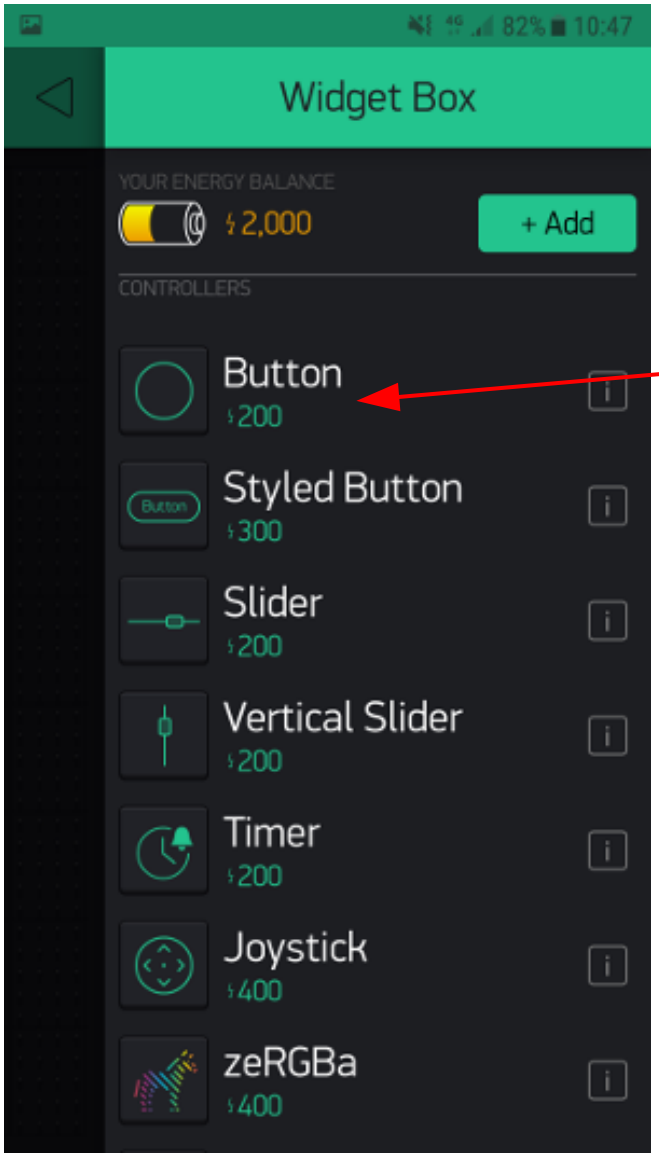
Now Click the Stop Button, so we can add some UI to our Dashboard.

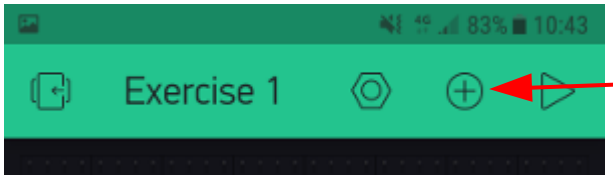
Challenge 2:
Add a Remote Light Switch

A POSTERIORI

Play · Experience · Learn

Challenge 2 : Add Light Switch

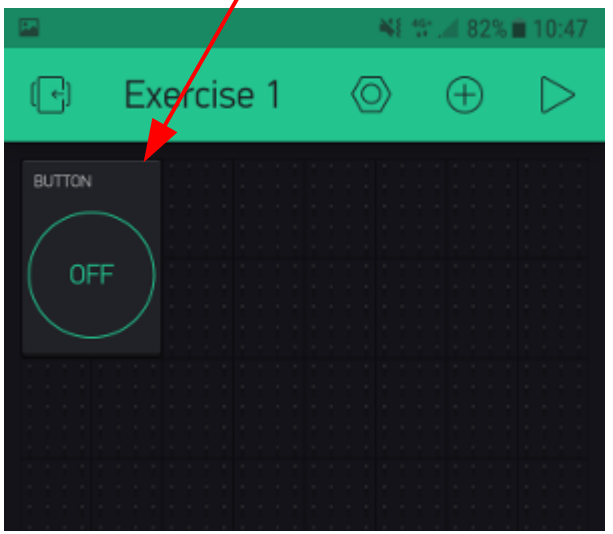




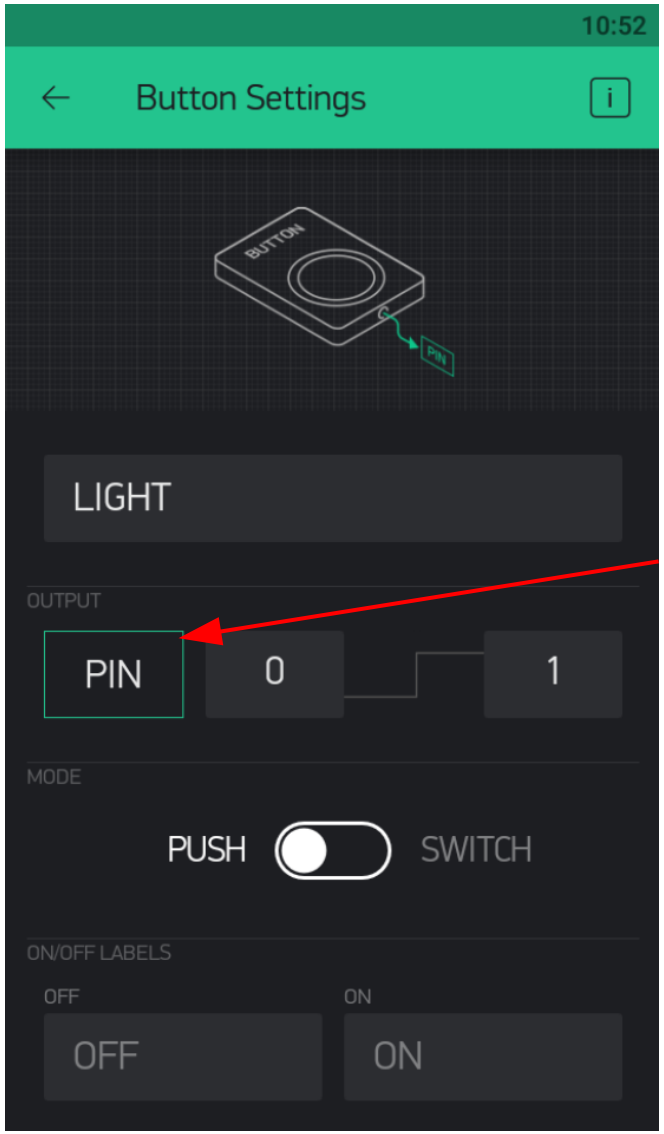
Tap the “+” to open a widget box

Tap this…

...to add a button to your screen



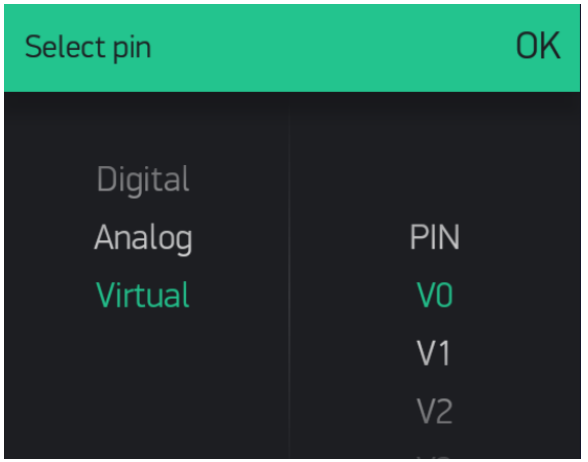
Challenge 2 : Add Light Switch



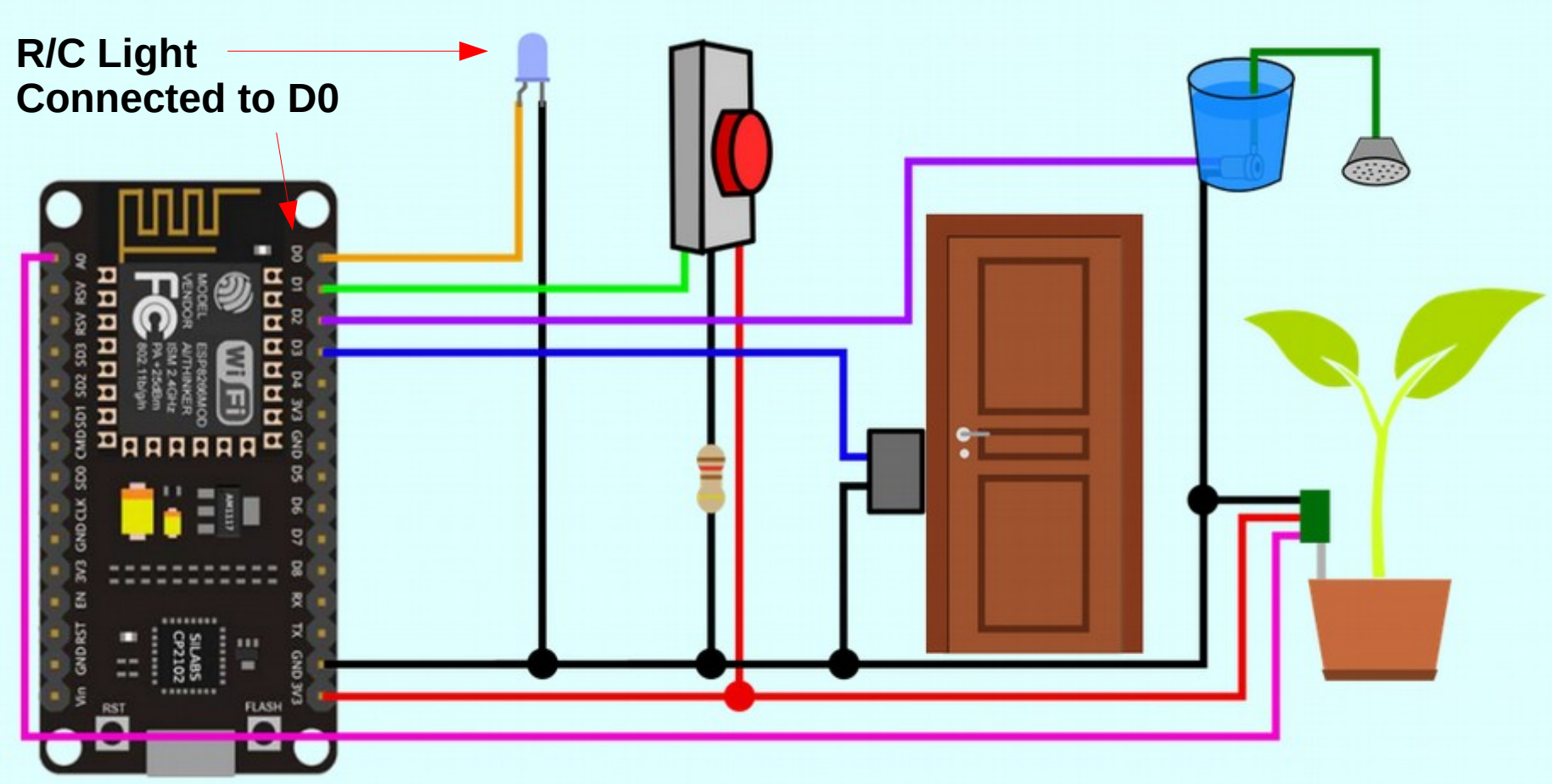
Tap your newly added button to configure it

Tap on “PIN” and select “Virtual | V0”

By default, Blynk will send a 0 when the button is released, and a 1 when the button is pressed. You can modify this by changing the 0 and 1 next to the PIN button.



Challenge 2 : Add Light Switch

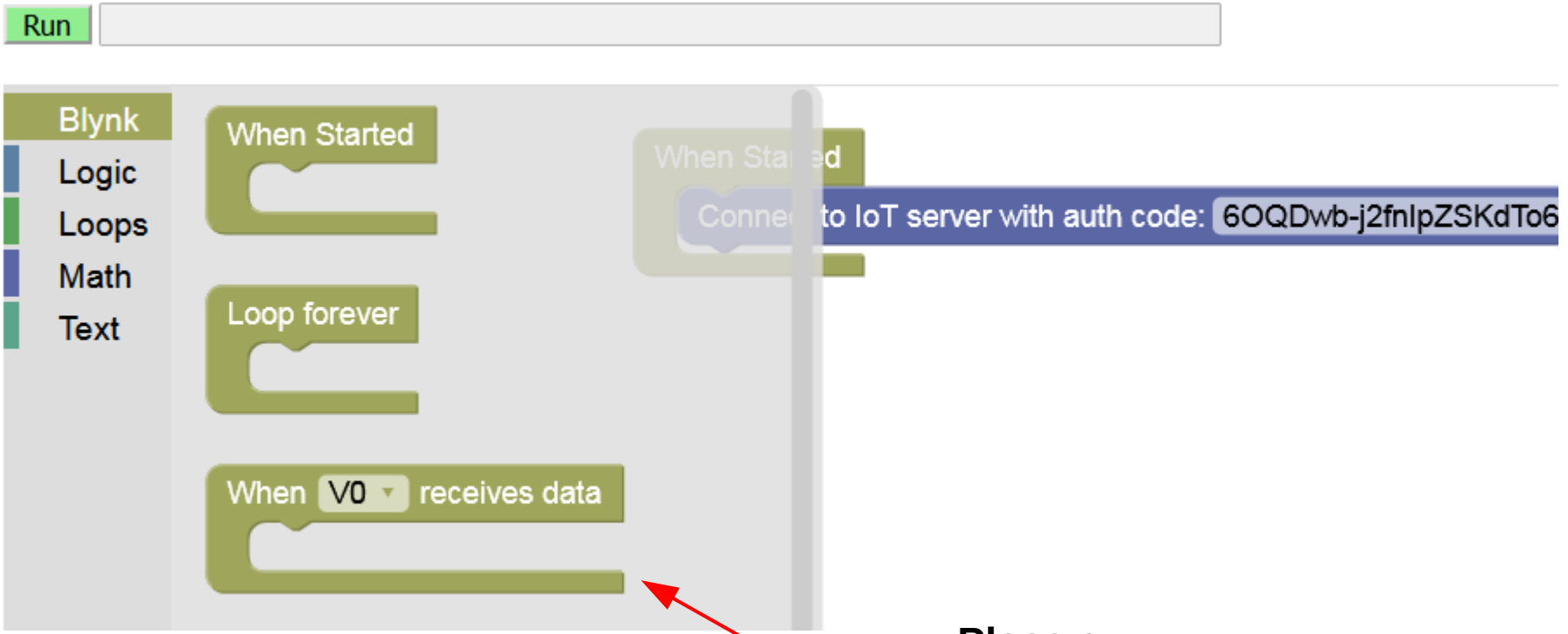


http://a9i.sg/iot

A POSTERIORI

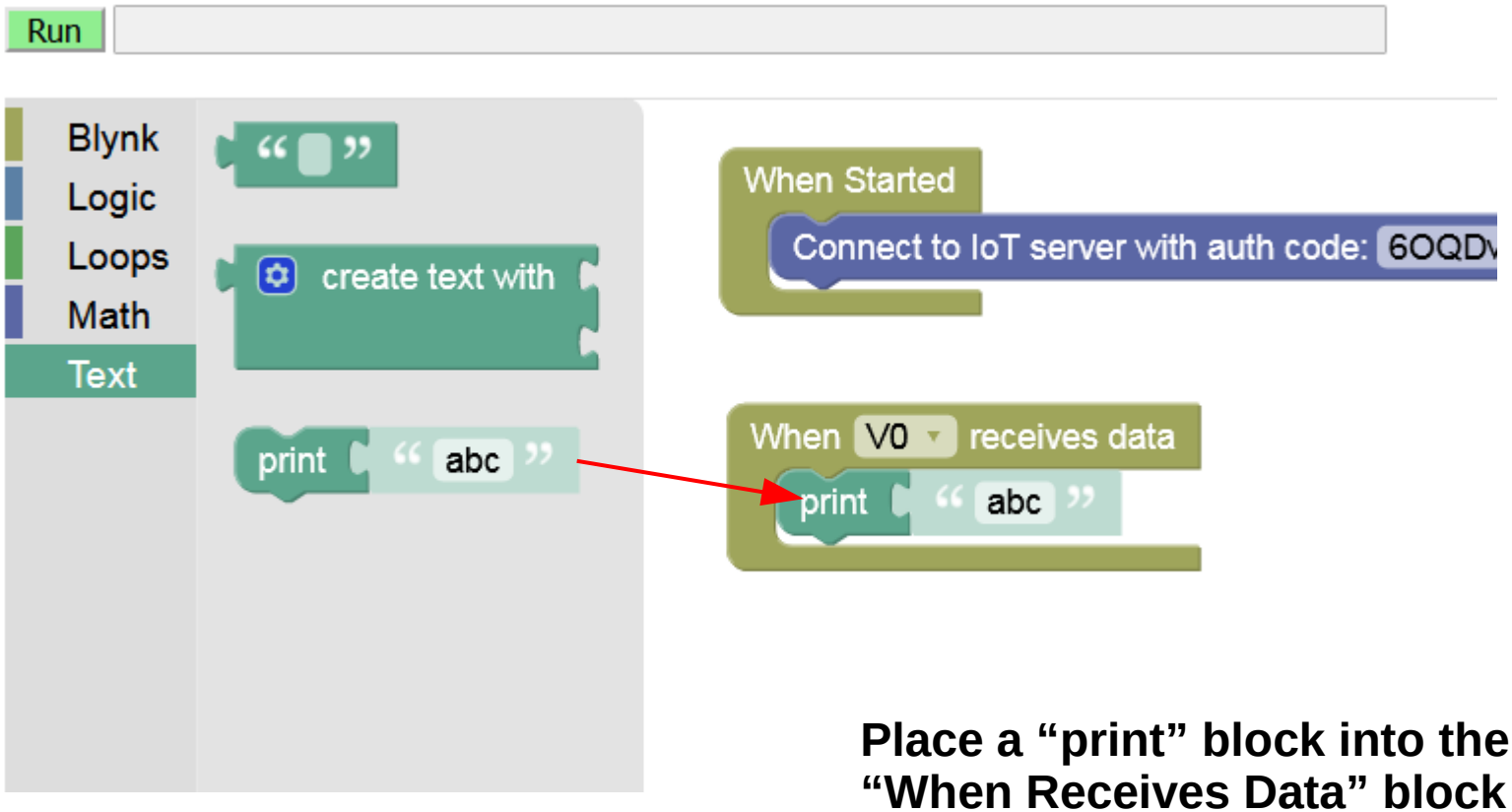
Play · Experience · Learn

Challenge 2 : Add Light Switch



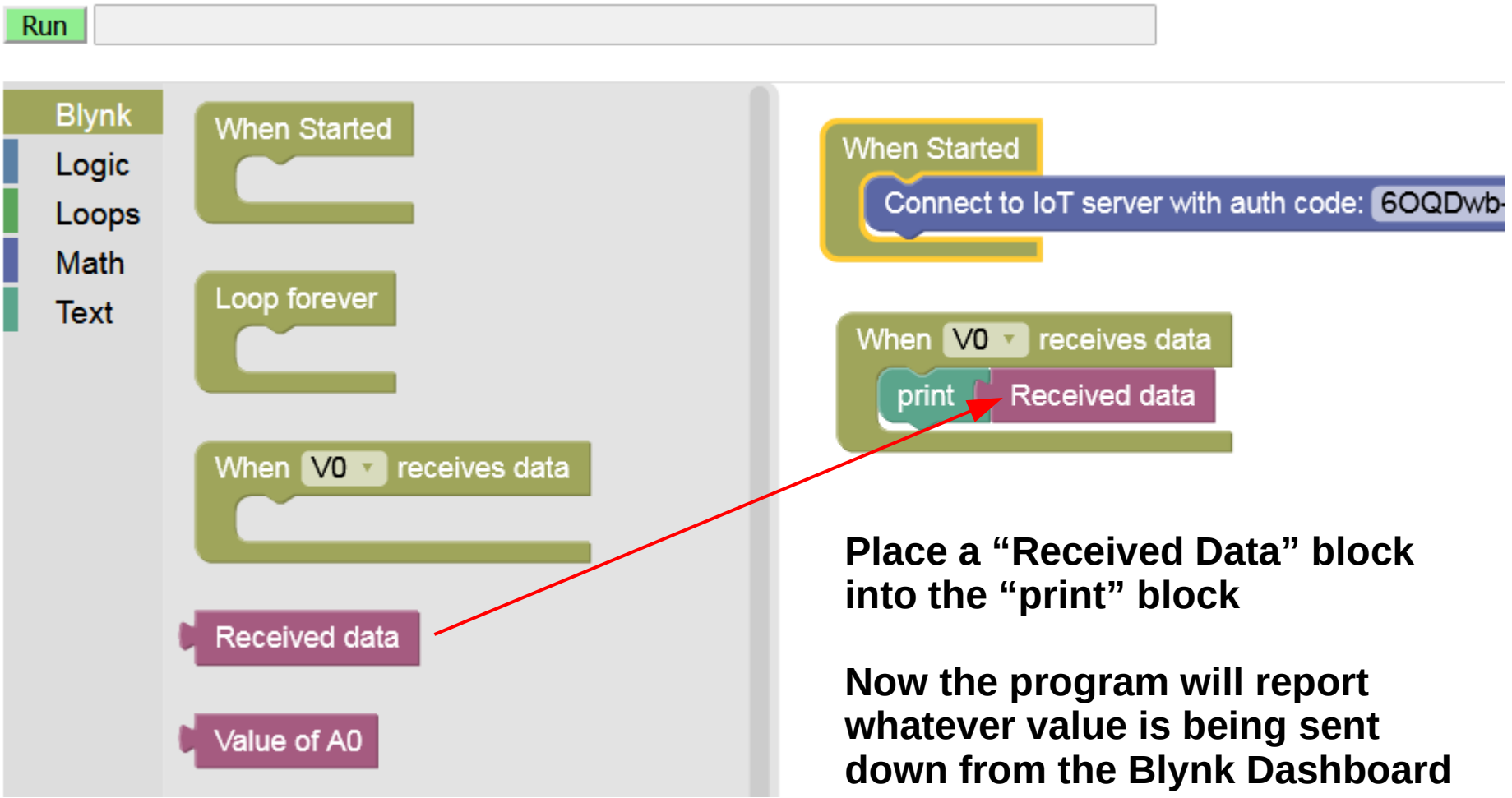
Place a "When Receives Data" block into the your programming area

Challenge 2 : Add Light Switch



Place a “print” block into the “When Receives Data” block

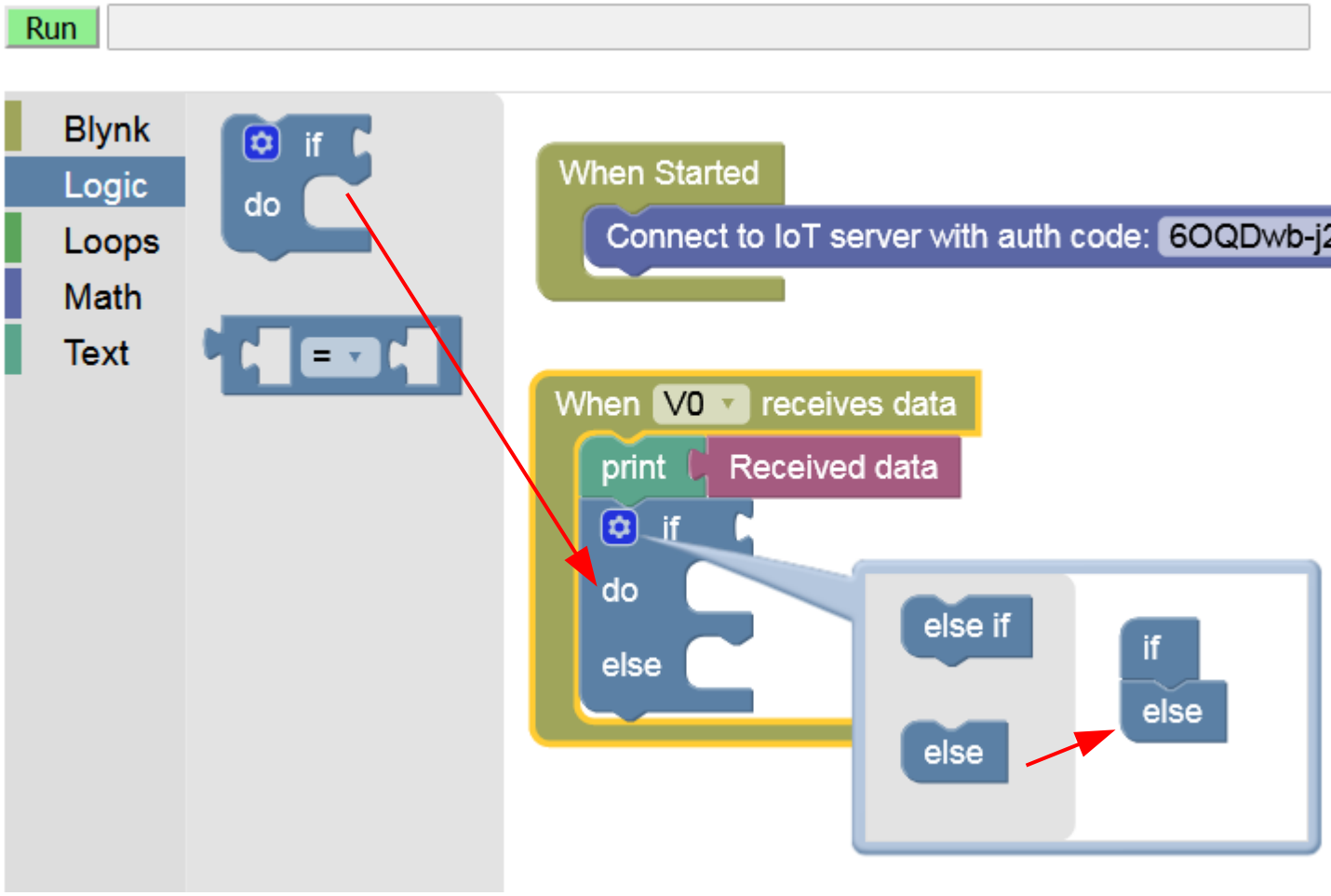
Challenge 2 : Add Light Switch



Place a “Received Data” block into the “print” block

Now the program will report whatever value is being sent down from the Blynk Dashboard

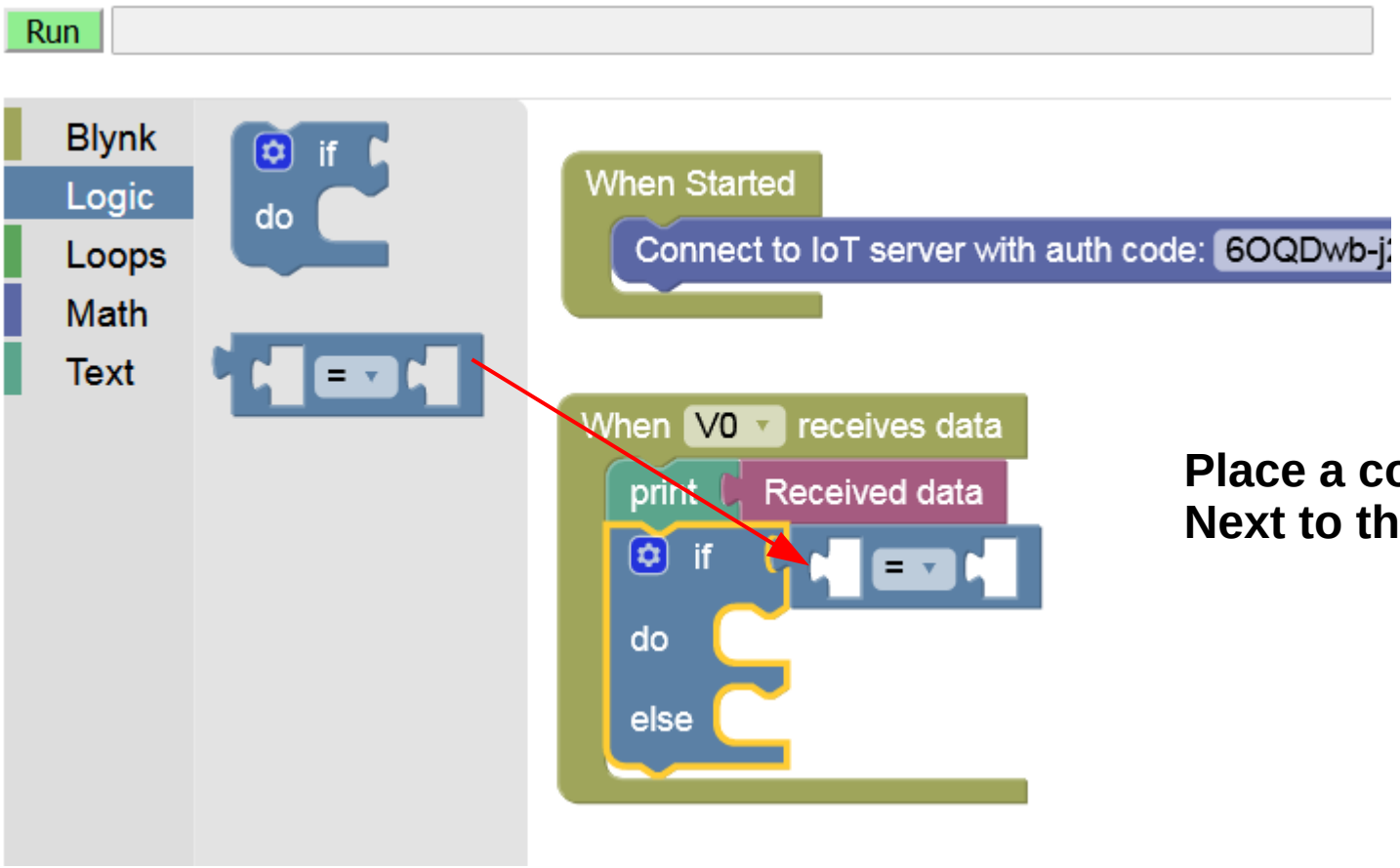
Challenge 2 : Add Light Switch



Place an “if” block under the “print” block

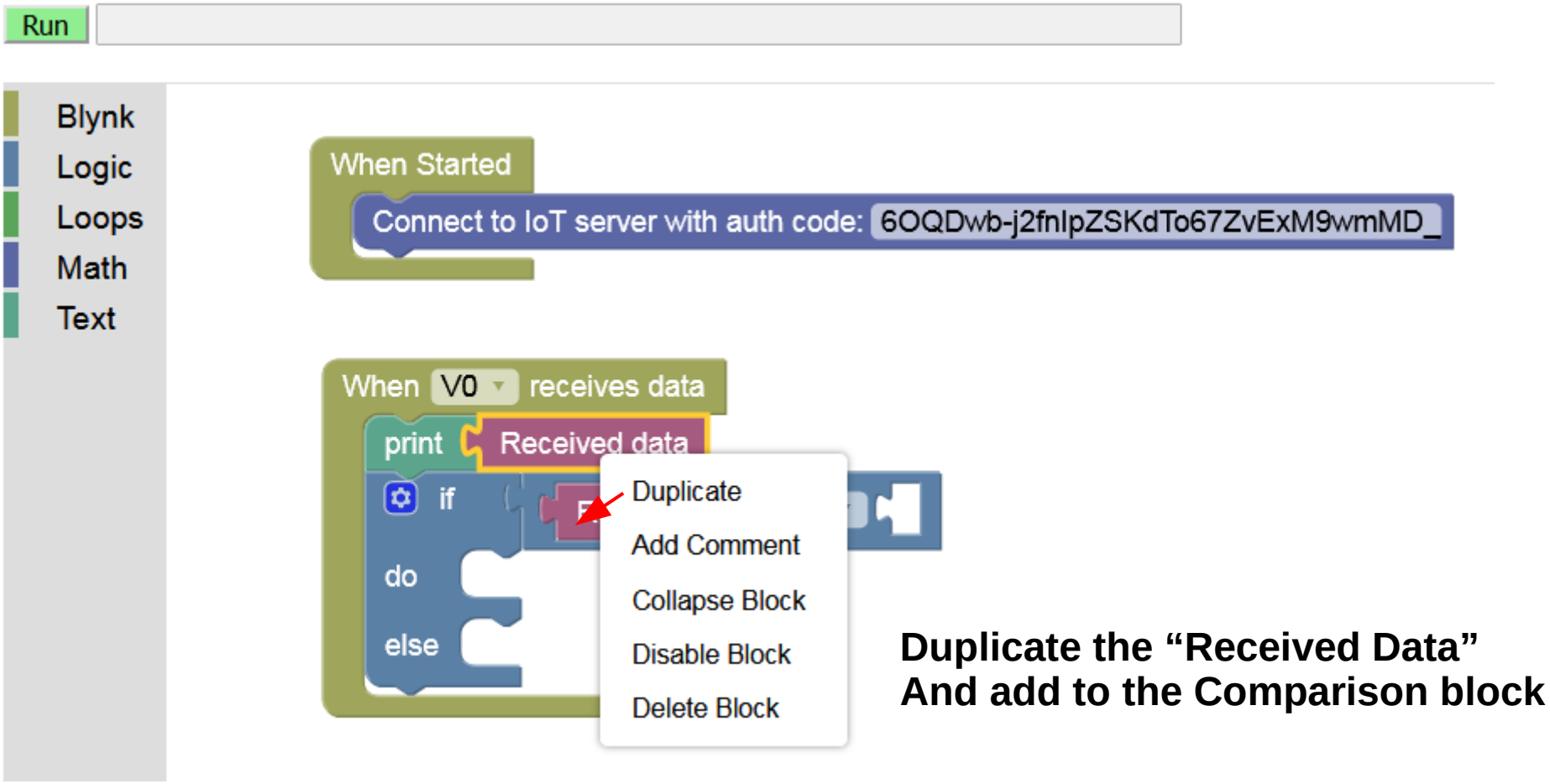
Click the gear icon and add an “else” under the “if”

Challenge 2 : Add Light Switch



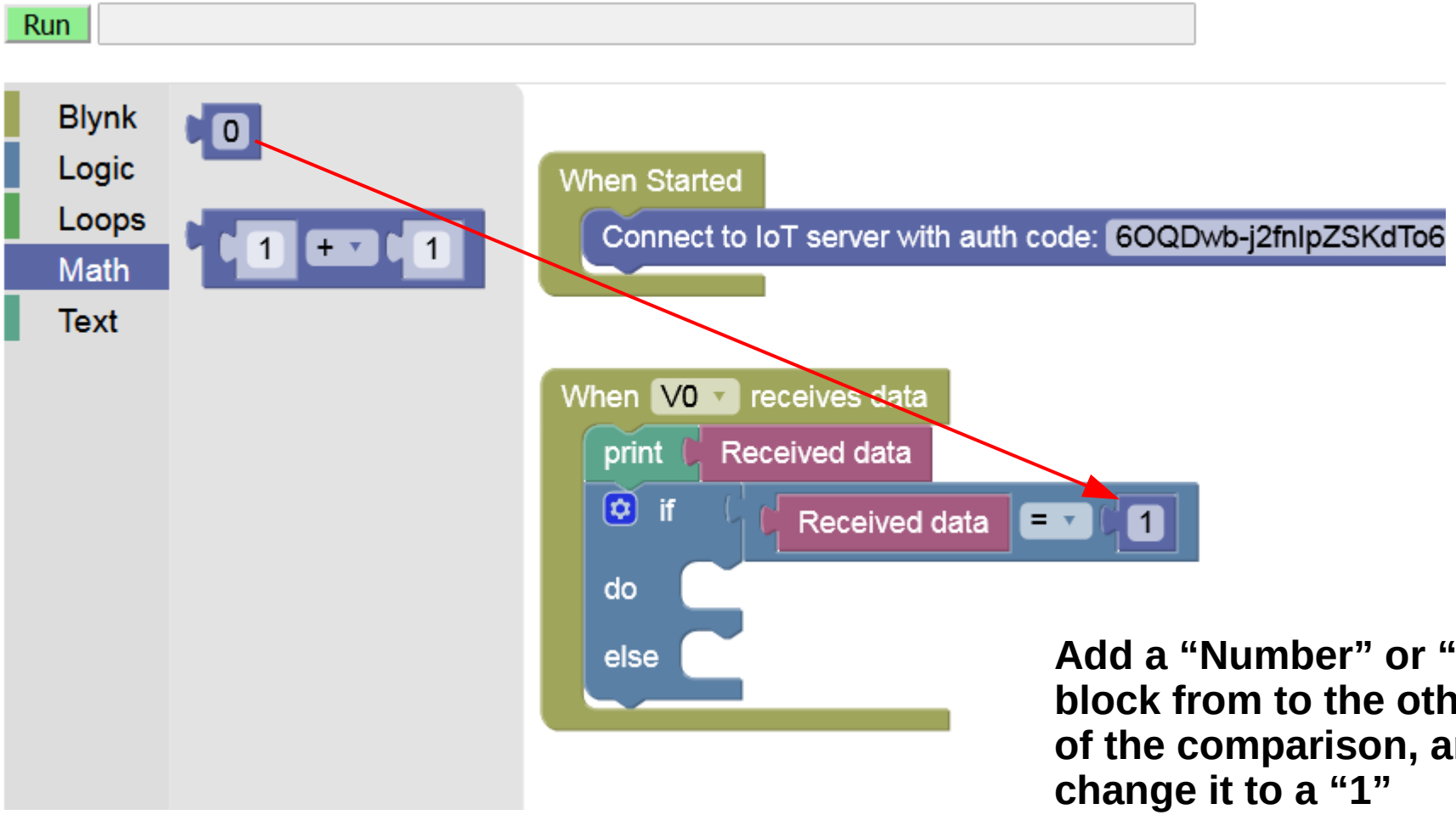
Place a comparison block Next to the “if”

Challenge 2 : Add Light Switch



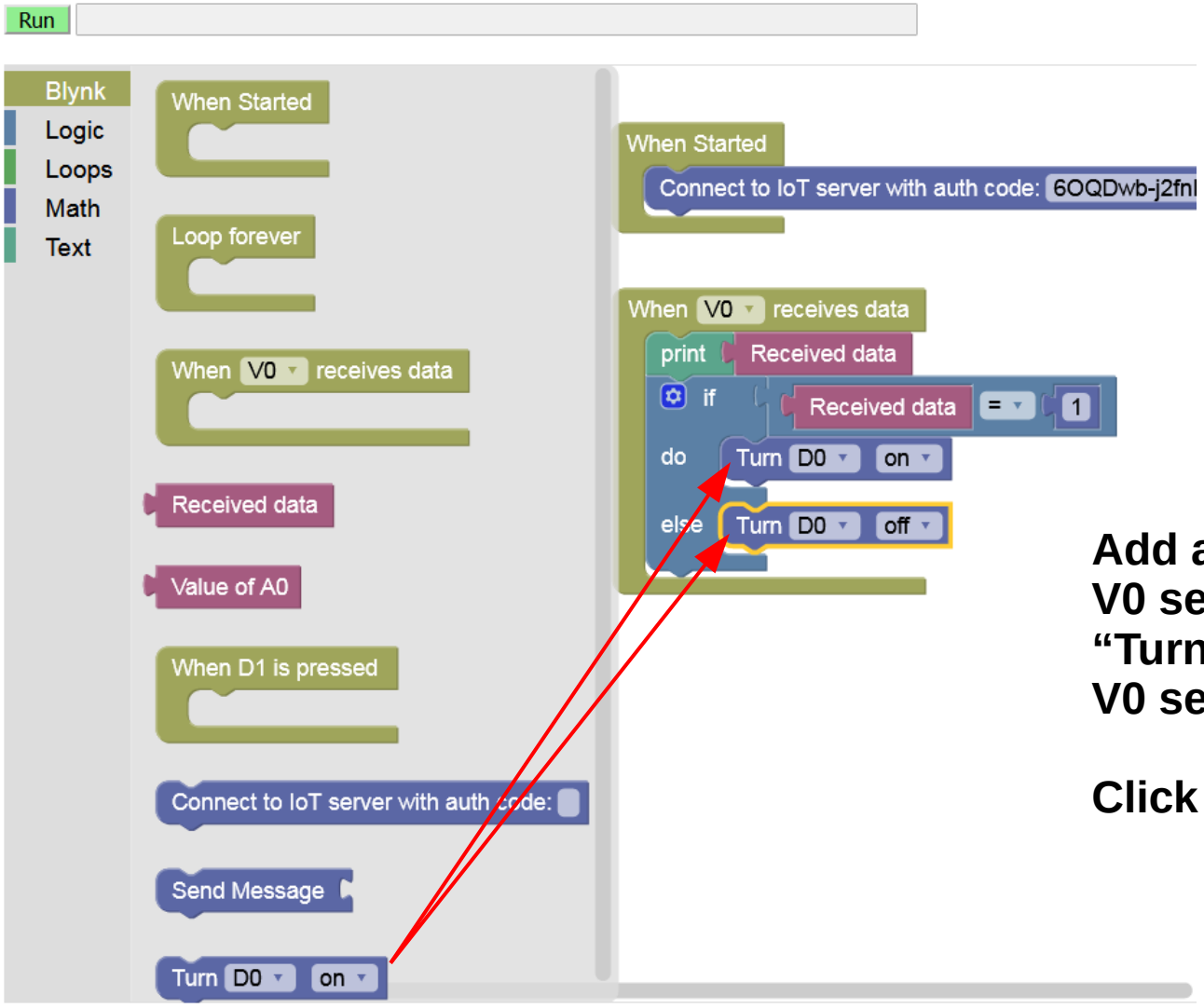
Duplicate the “Received Data”
And add to the Comparison block

Challenge 2 : Add Light Switch



Add a “Number” or “0” block from to the other side of the comparison, and change it to a “1”

Challenge 2 : Add Light Switch



Add a “Turn Pin On” when V0 sends “1”, and a “Turn Pin Off” when V0 sends “0”

Click Run and Test!

Challenge 3:
Add a Remote Door Lock

A POSTERIORI

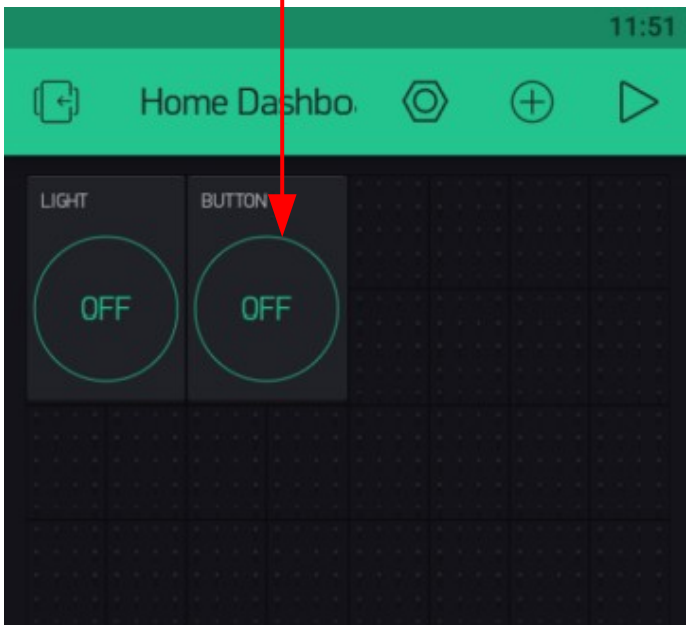
Play · Experience · Learn

Challenge 3 : Add Door Lock

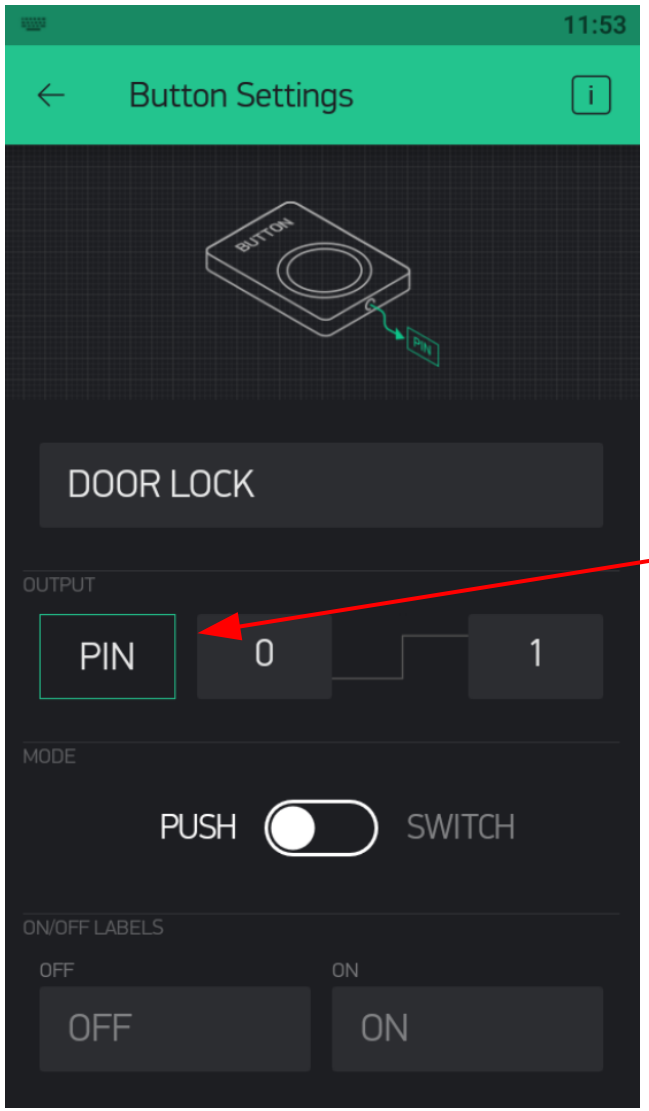
Tap the “+” to open a widget box

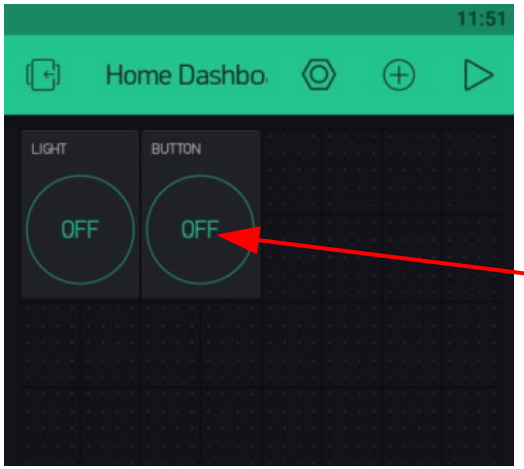
Tap this…

...to add another button to your screen



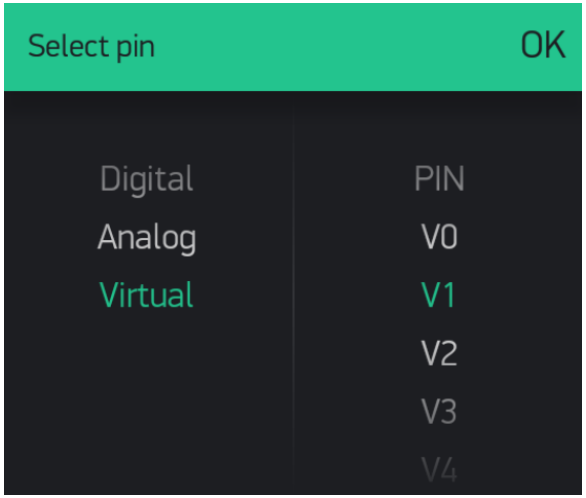
Challenge 3 : Add Door Lock



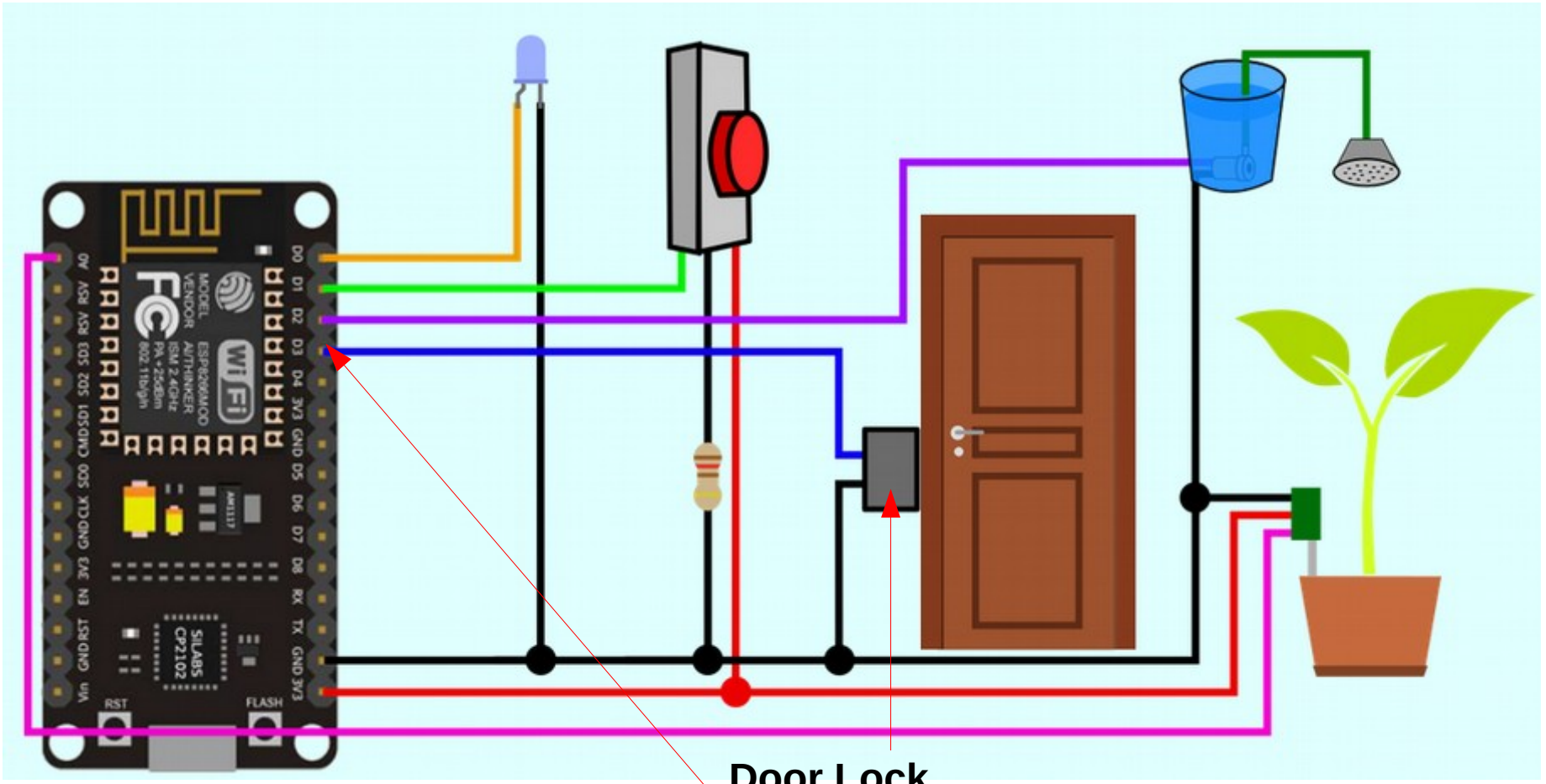


Tap your newly added button to configure it

Tap on “PIN” and select “Virtual | V1”



Challenge 3 : Add Door Lock

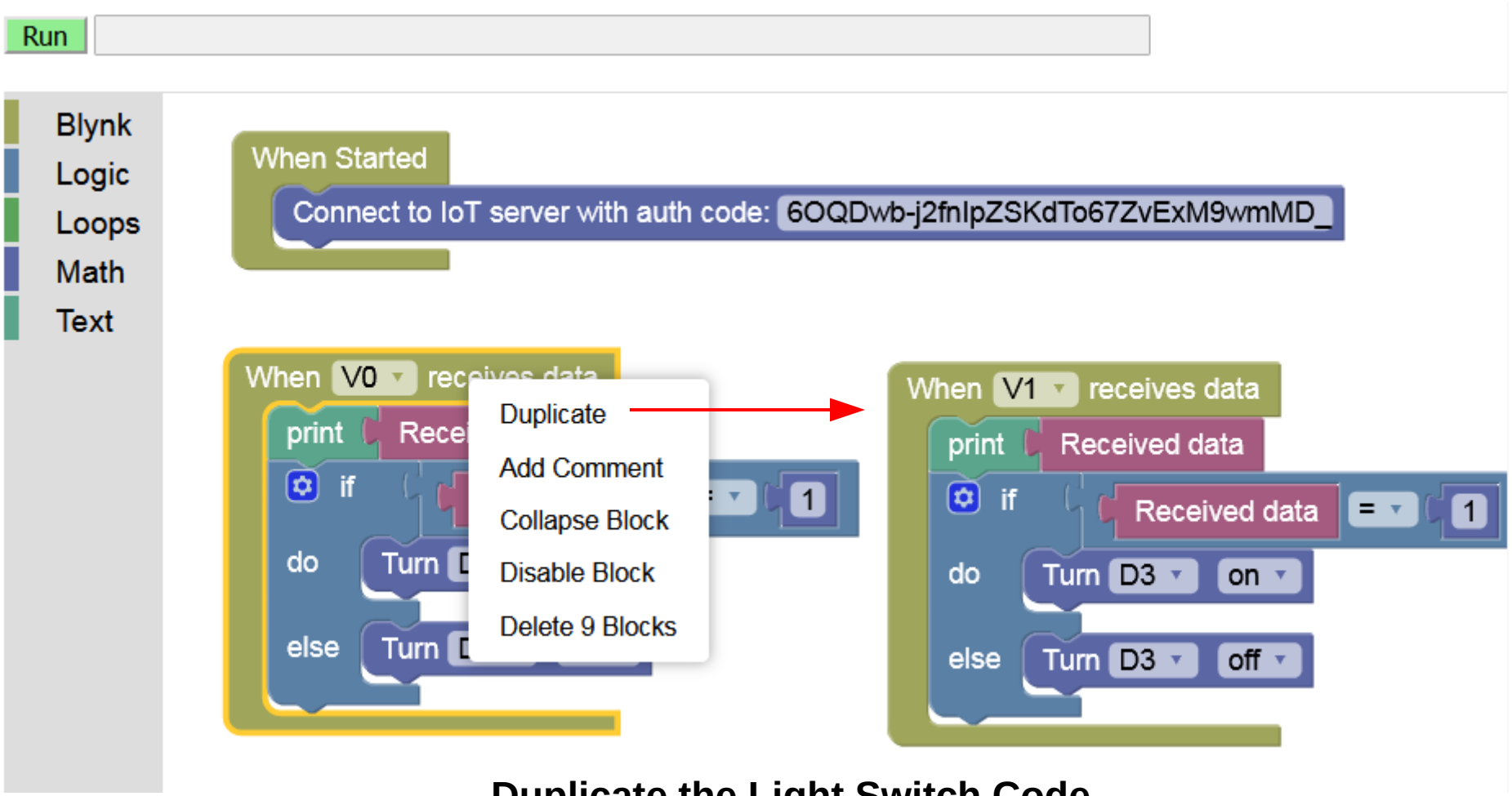


http://a9i.sg/iot

A POSTERIORI

Play · Experience · Learn

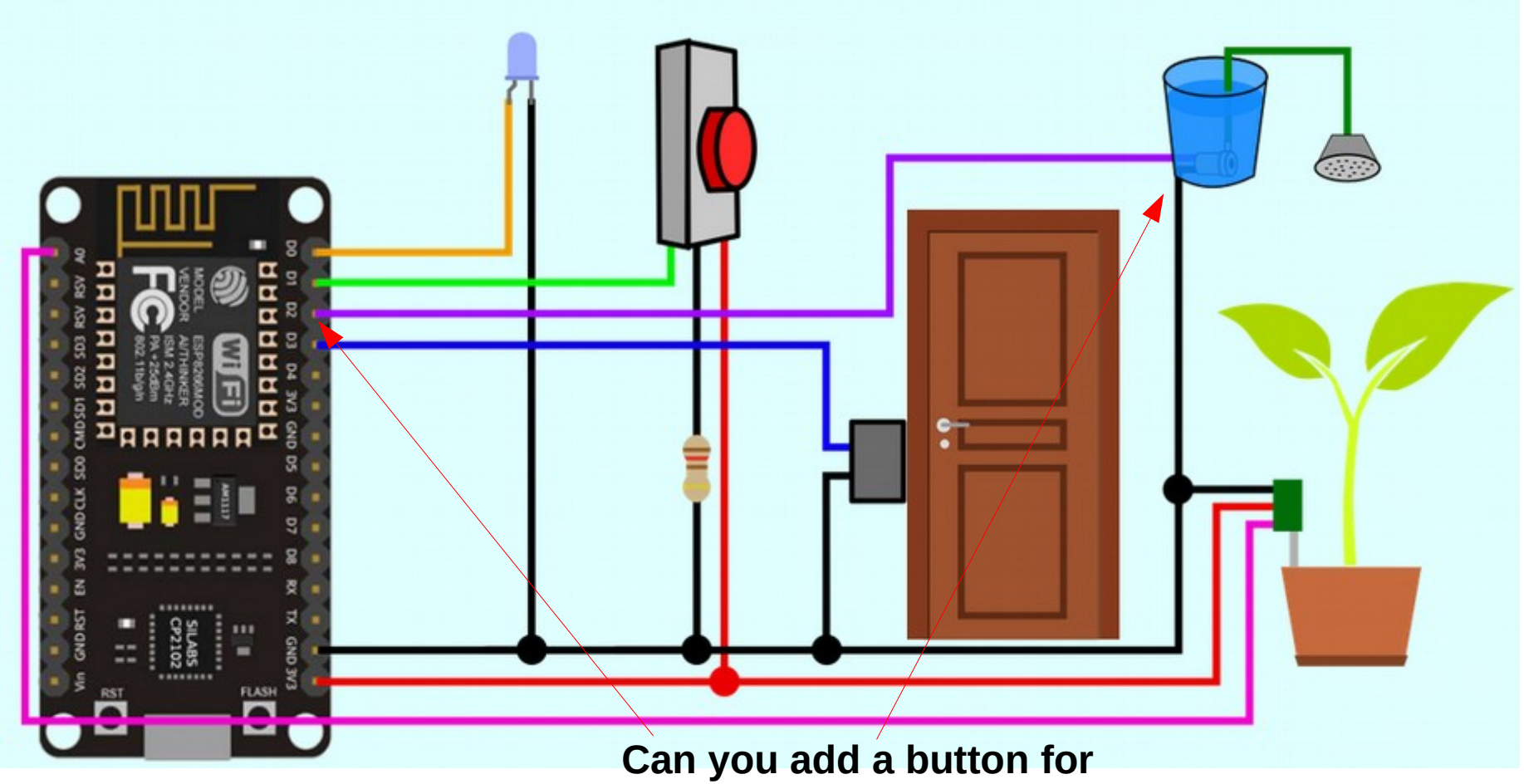
Challenge 3 : Add Door Lock



Duplicate the Light Switch Code

- **Change V0 => V1**
- **Change D1 => D3**

Challenges and Improvements



Can you add a button for the plant watering pump?

http://a9i.sg/iot

A POSTERIORI

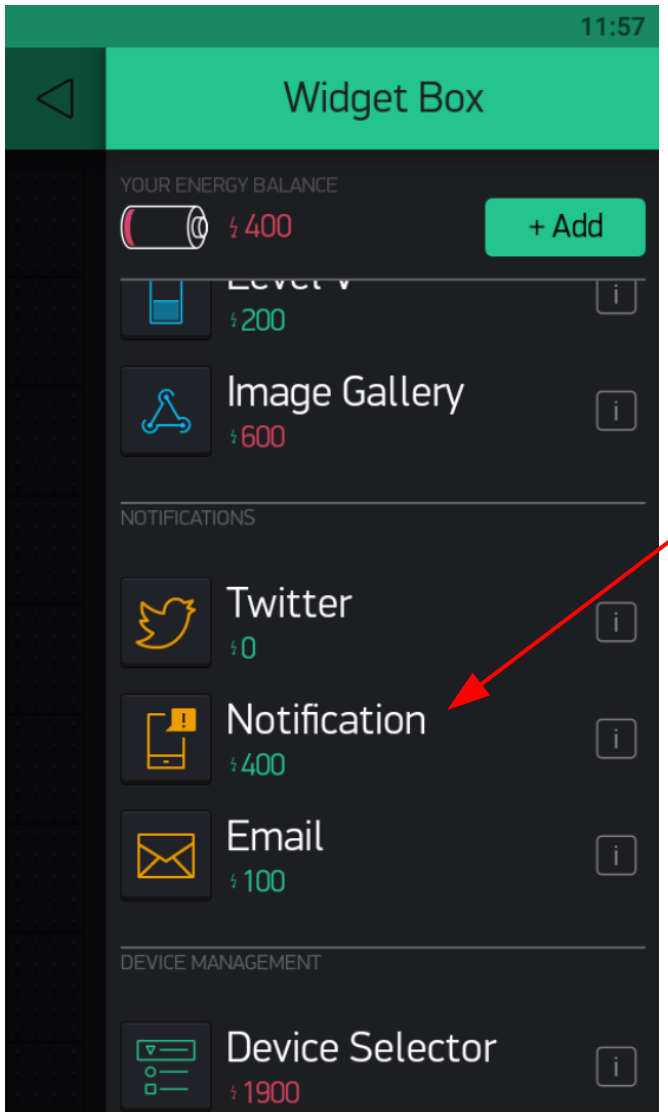
Play · Experience · Learn

Challenge 4:
Add a Door Bell Alert

A POSTERIORI

Play · Experience · Learn

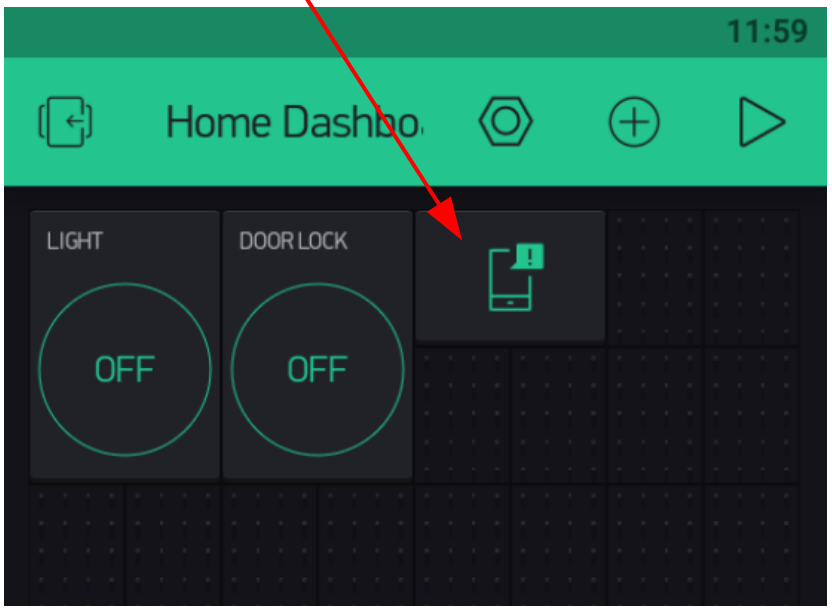
Challenge 4 : Add Door Bell



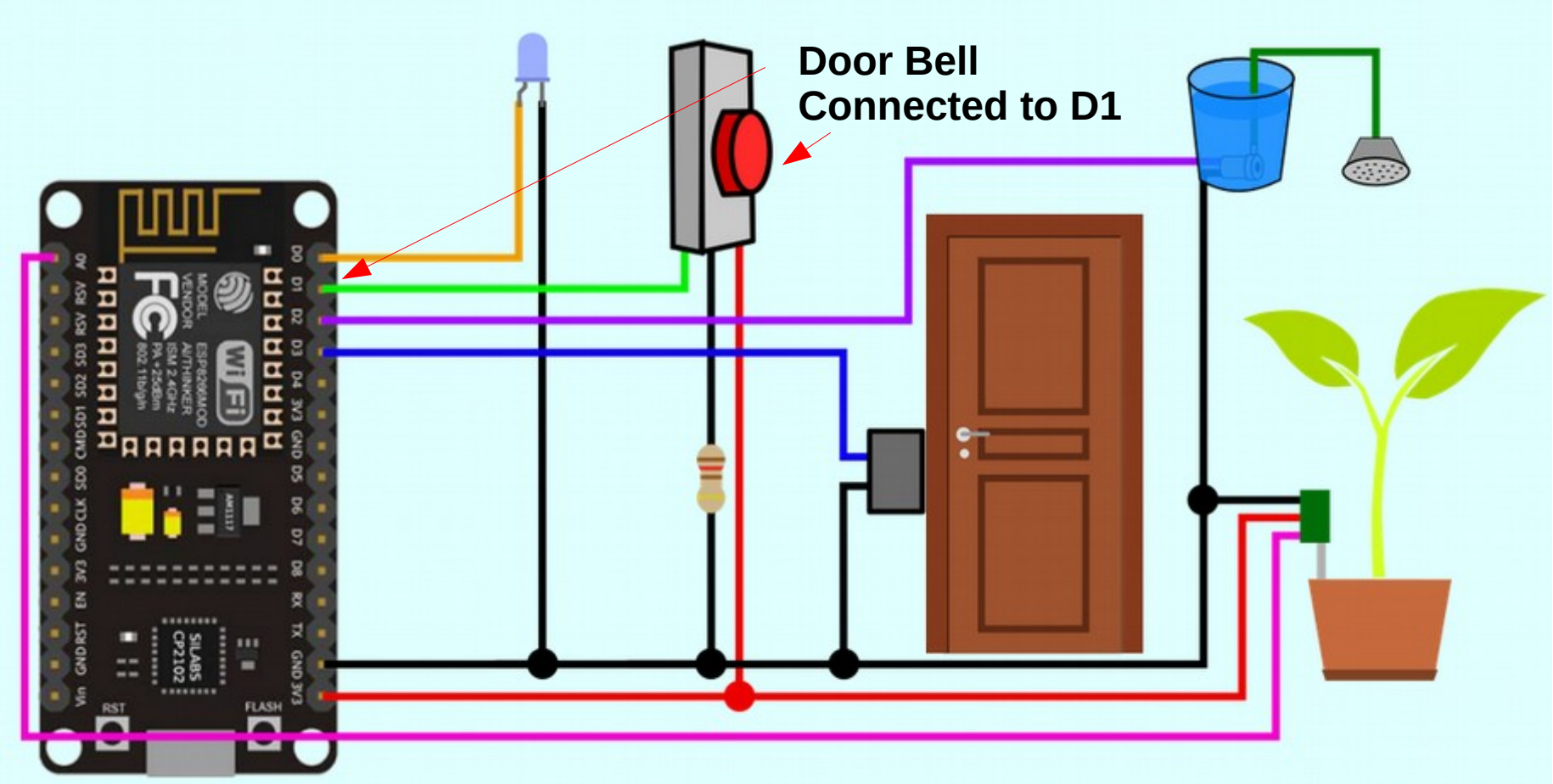
Tap the “+” to open a widget box

Tap this…

...to add Notification capability



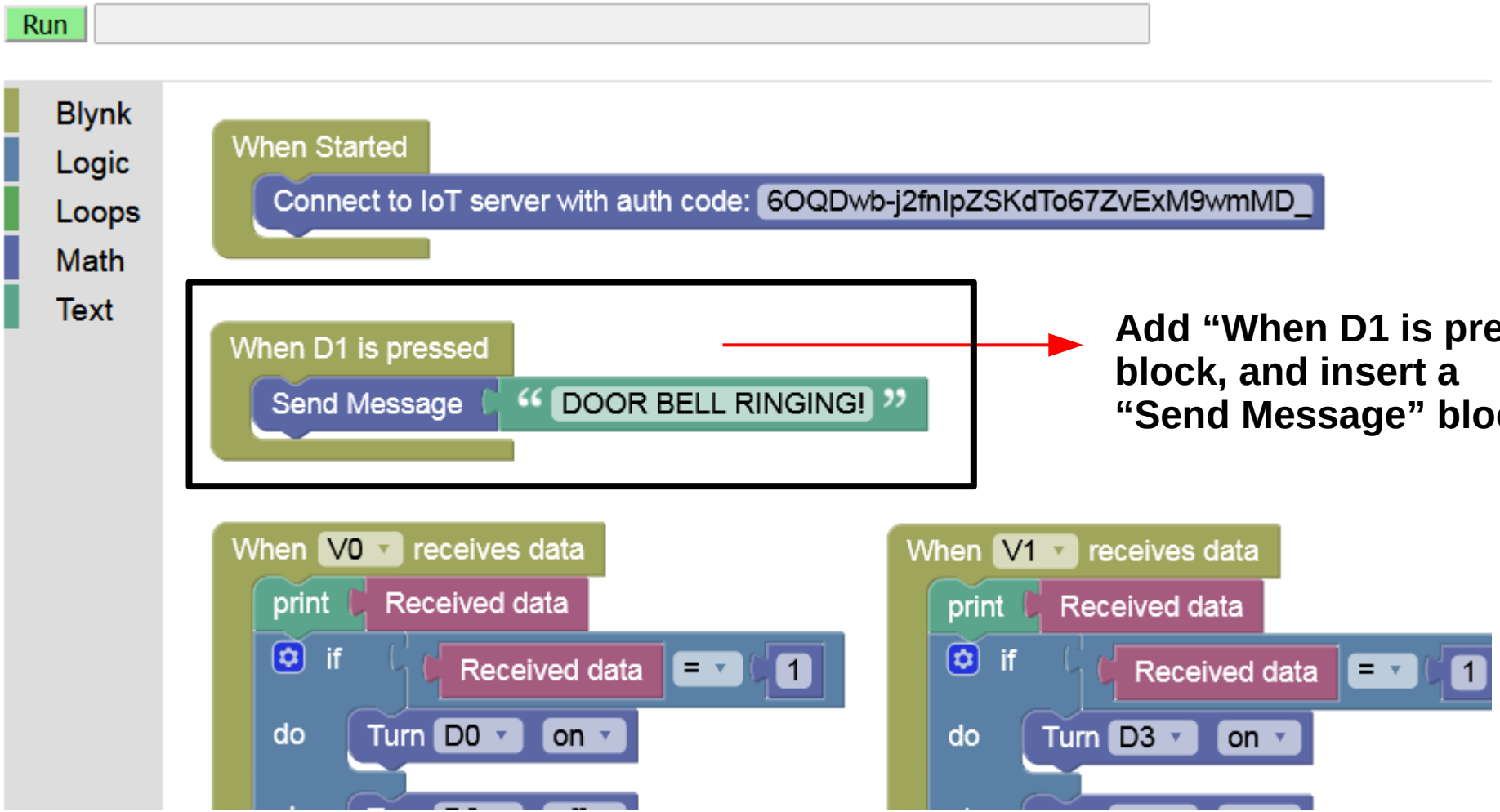
Challenge 4 : Add Door Bell



http://a9i.sg/iot

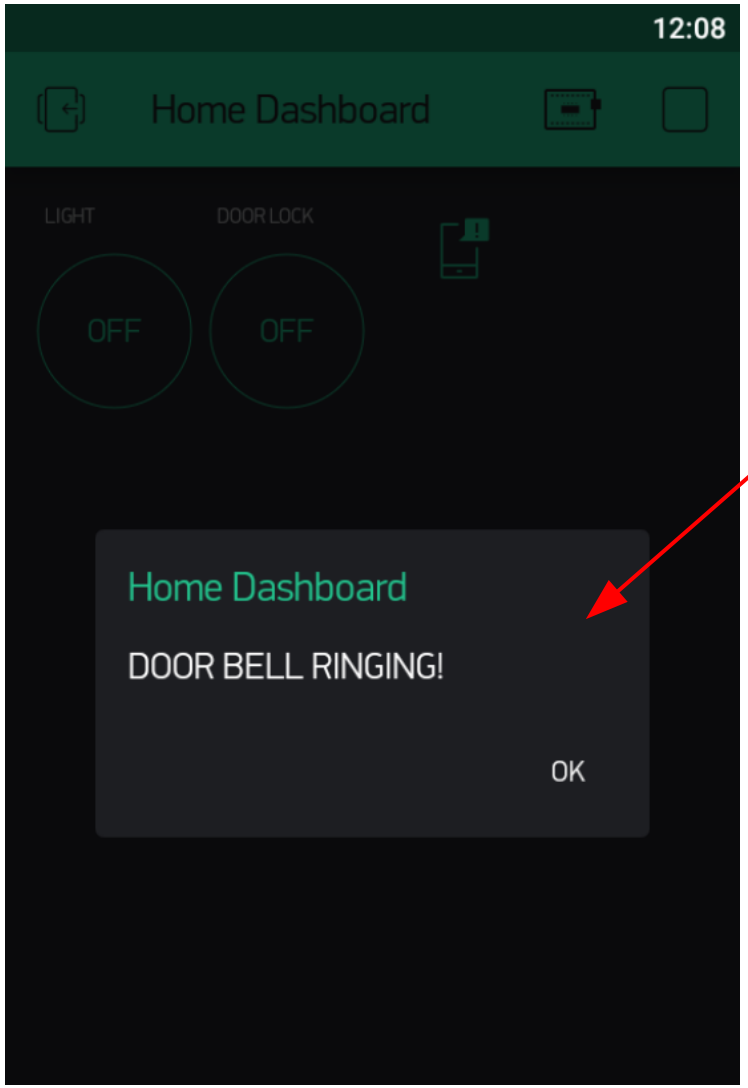
A POSTERIORI
Play · Experience · Learn

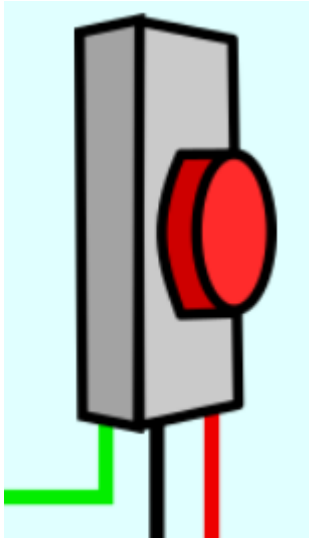
Challenge 4 : Add Door Bell



Add “When D1 is pressed” block, and insert a “Send Message” block

Challenge 4 : Add Door Bell





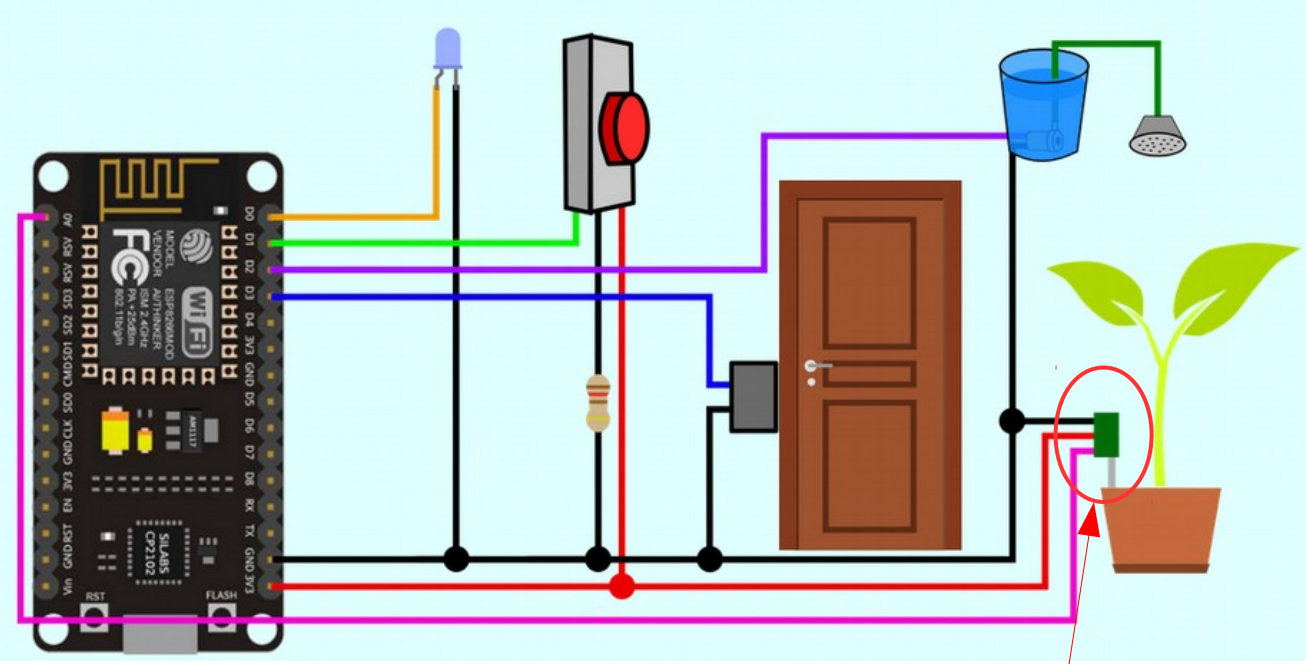
Click the Door Bell to test the Notification protocol

Challenge 5:
Check Soil Moisture

A POSTERIORI

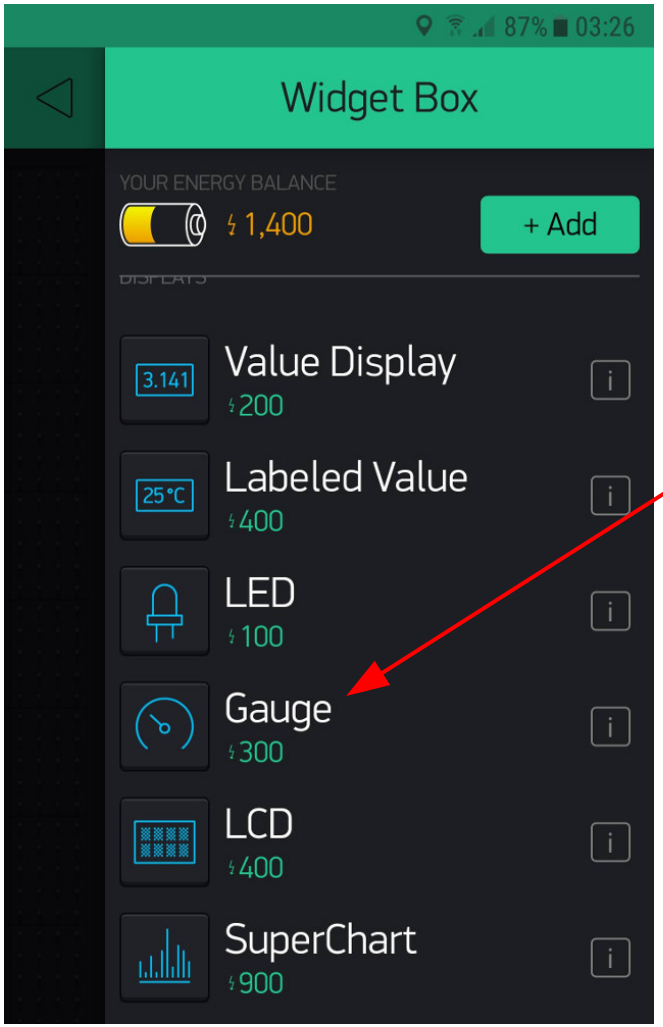
Play · Experience · Learn

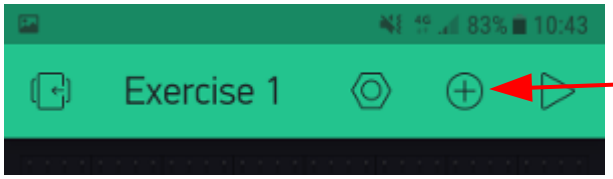
Challenge 5 : Check Soil Moisture



Soil moisture sensor connected to A0

Challenge 5 : Check Soil Moisture

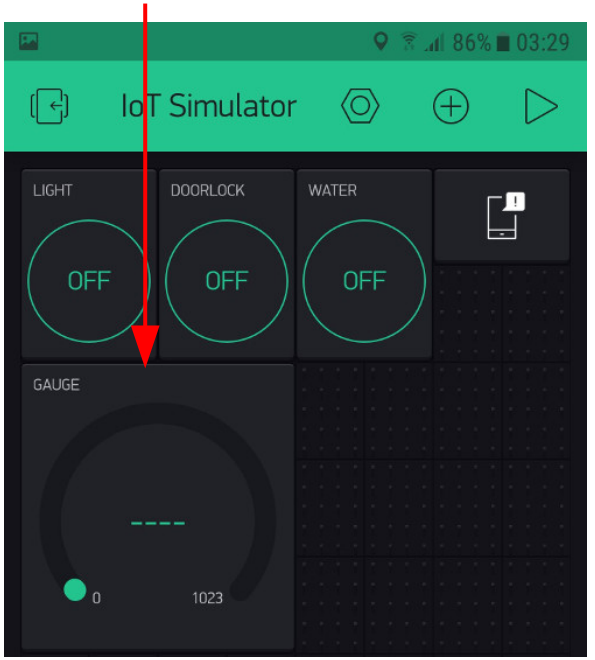




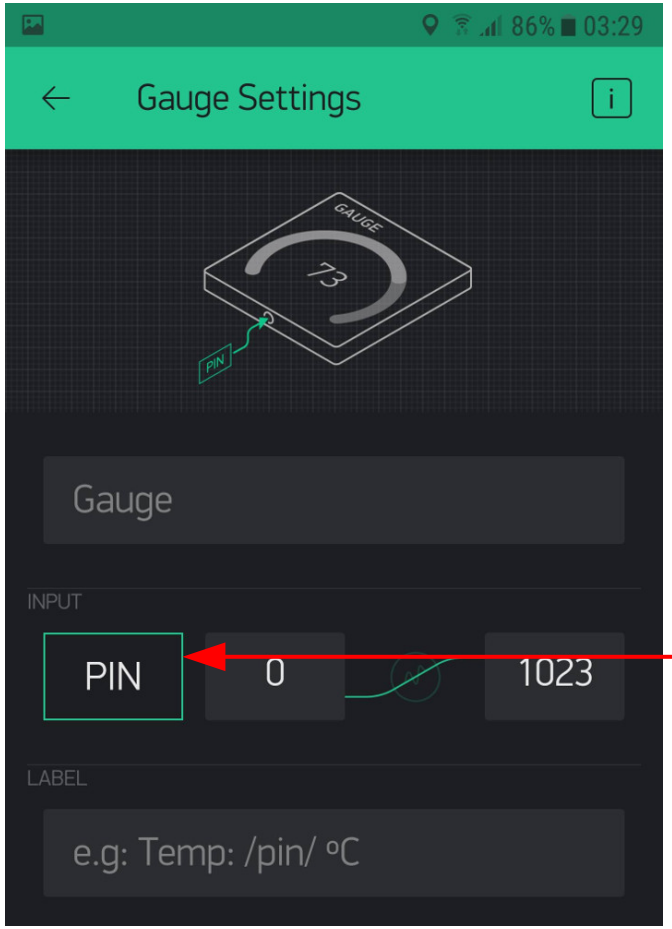
Tap the “+” to open a widget box

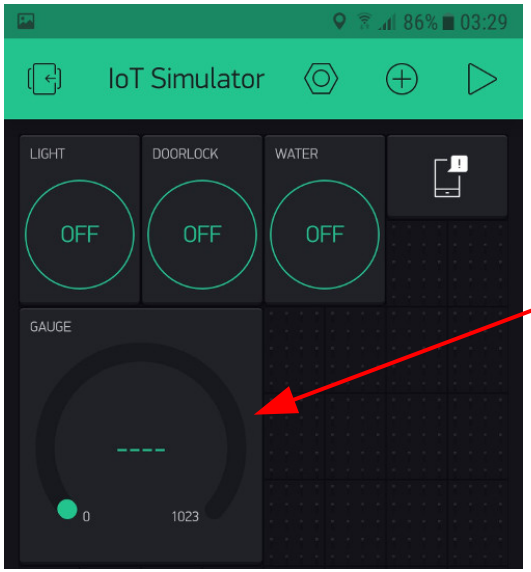
Tap this…

...to add a gauge display



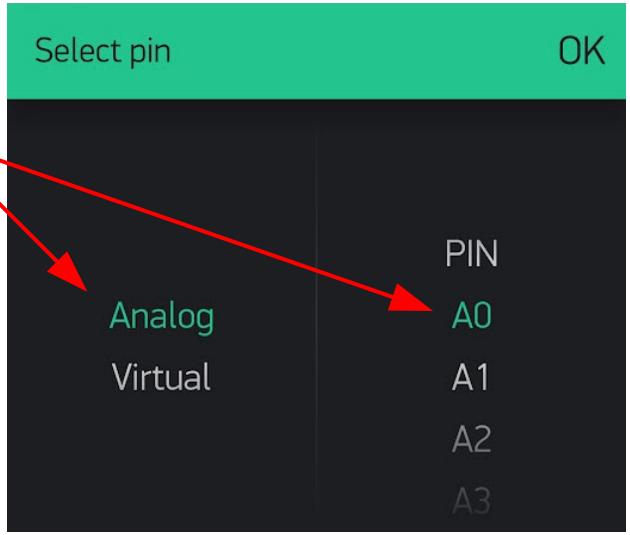
Challenge 5 : Check Soil Moisture



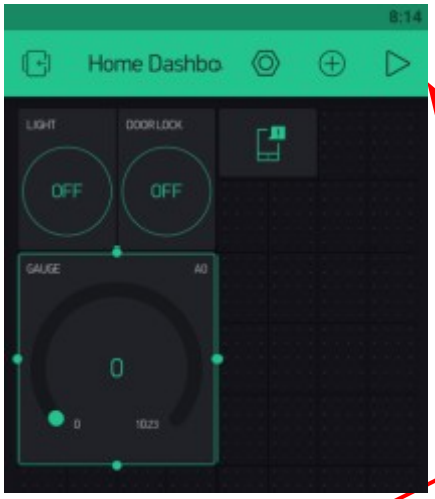


Tap the gauge to configure it

Tap on “PIN” and select “Analog | A0”



Challenge 5 : Check Soil Moisture

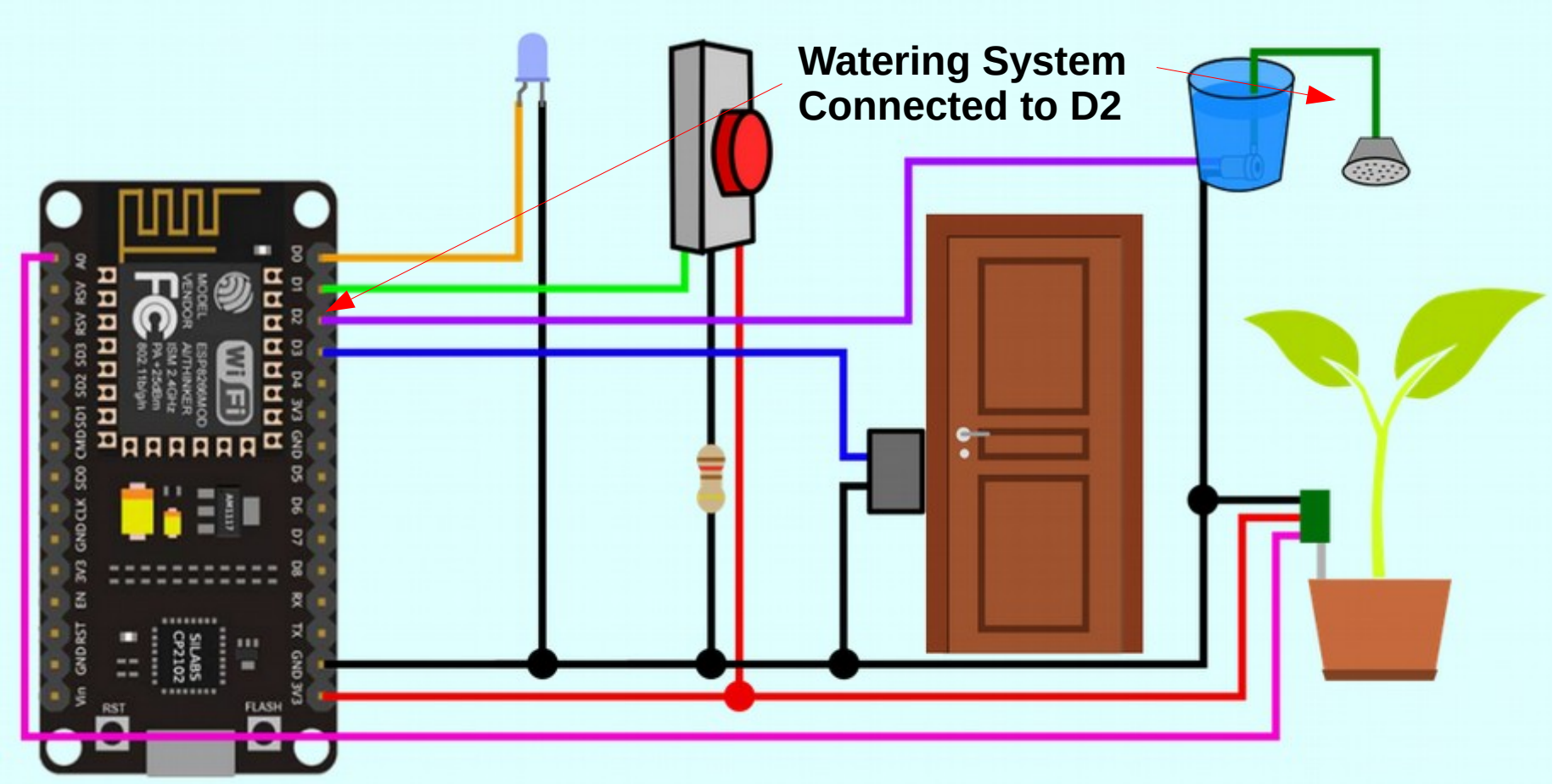


Run both the Blynk app and the IoT simulator

No coding required. Blynk automatically reads from the connected sensor.

You will see the soil moisture level going down.

Challenge 5b : Add Water

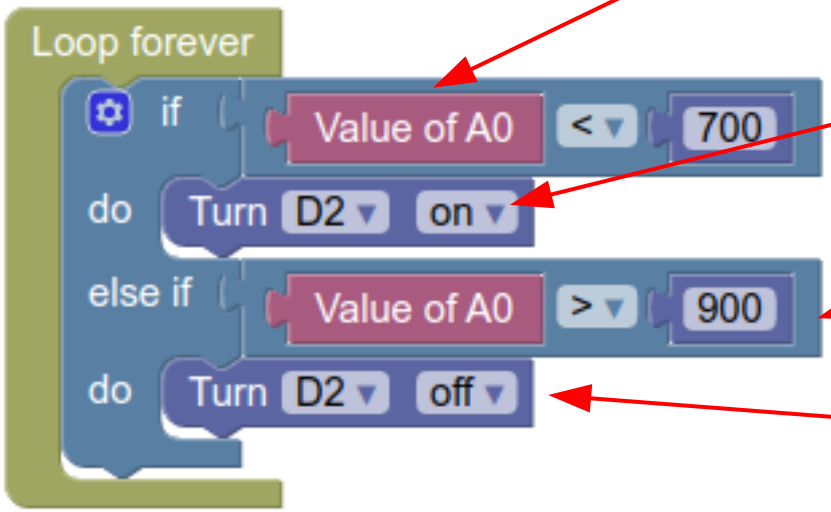


http://a9i.sg/iot

A POSTERIORI
Play · Experience · Learn

Challenges and Improvements

Automatic Watering



Check if the soil is dry (less than 700)

If it is, turn on the watering pump

If the soil is moist (greater than 900)...

...turn off the watering pump

Challenges and Improvements

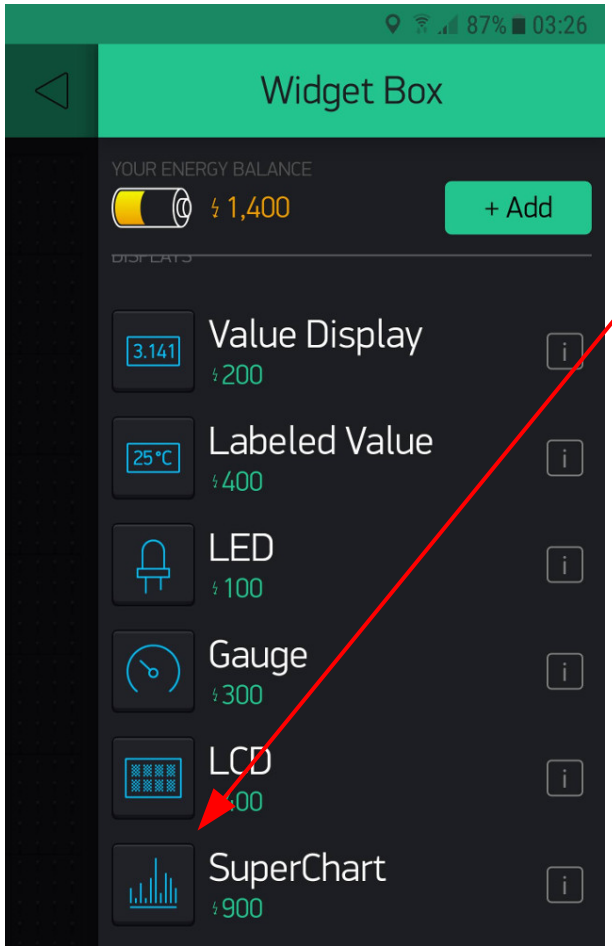
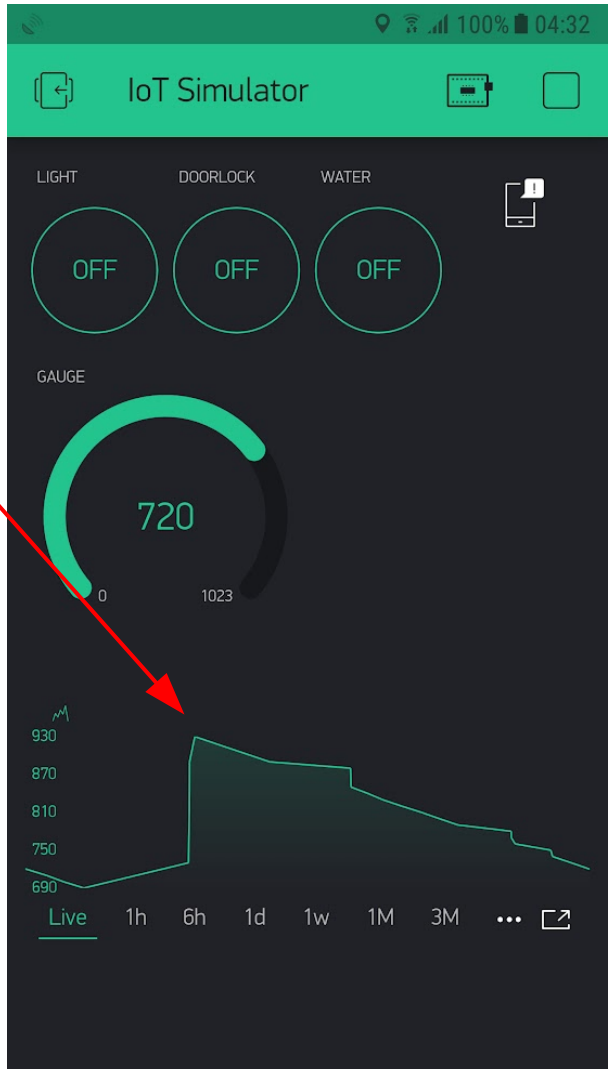
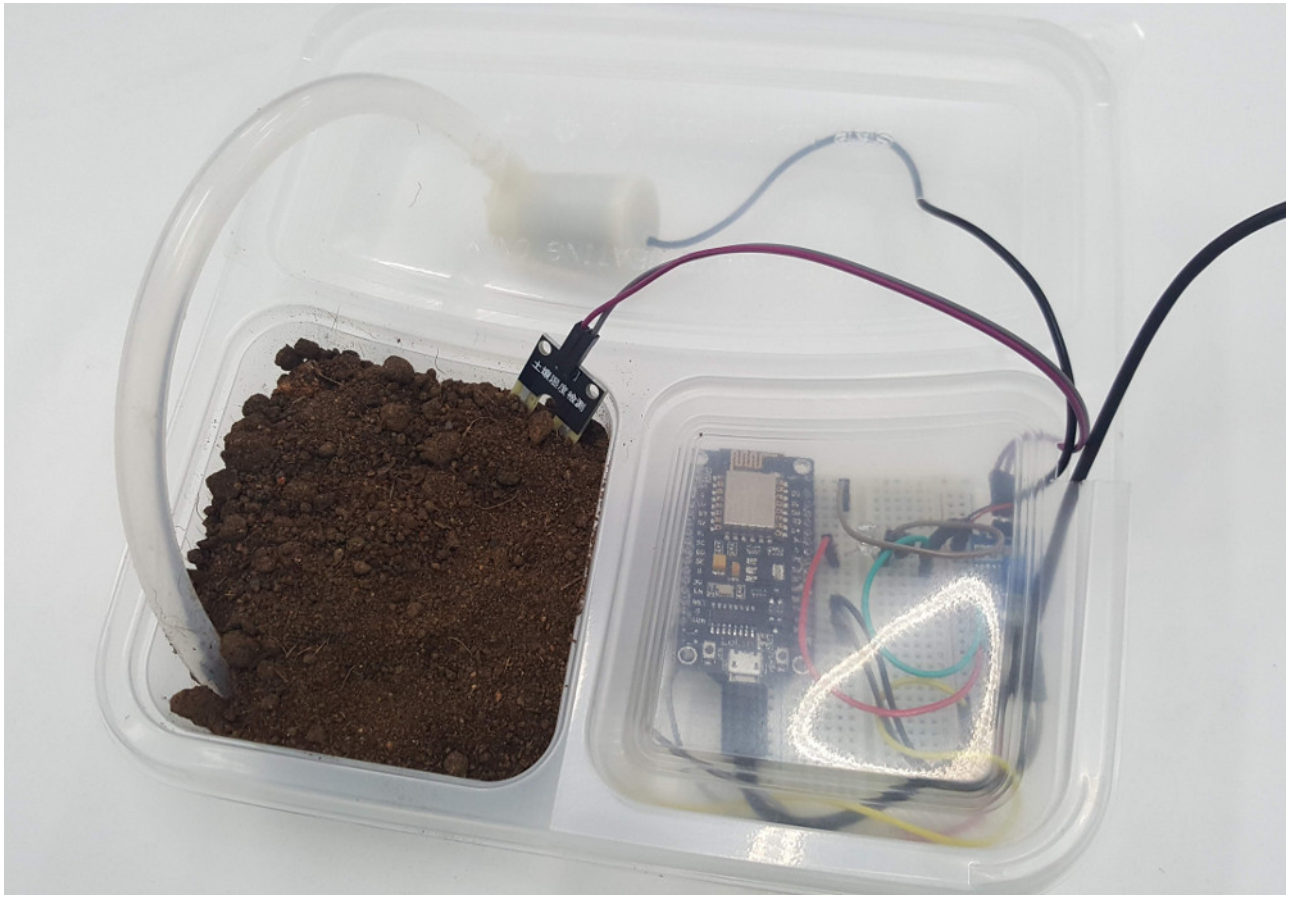
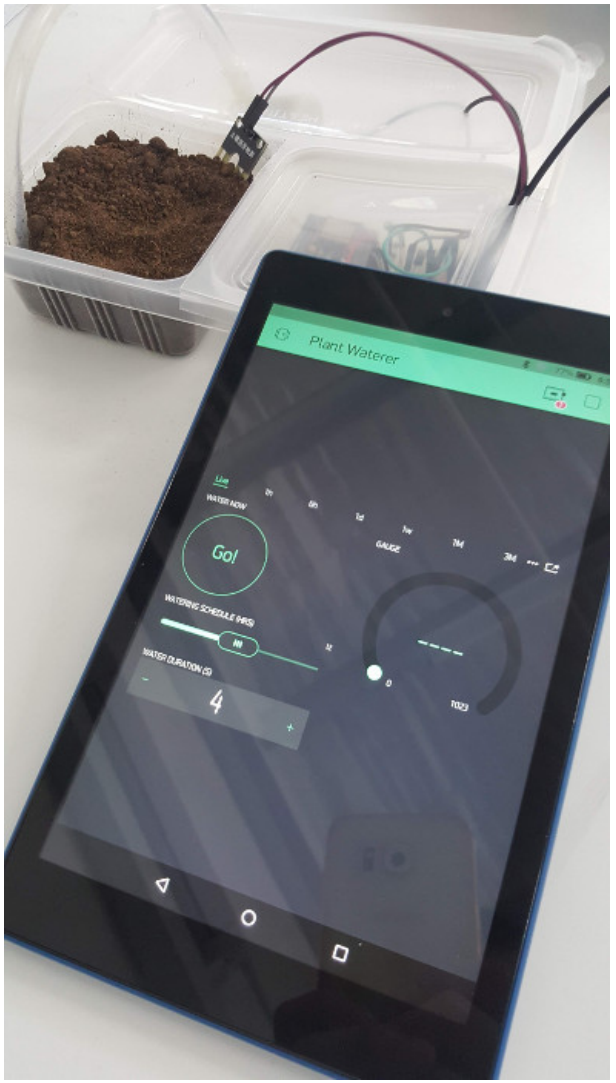


Chart the soil moisture level



Challenges and Improvements





Challenges and Improvements

Plant Watering System
(complete with controllable LED lights)

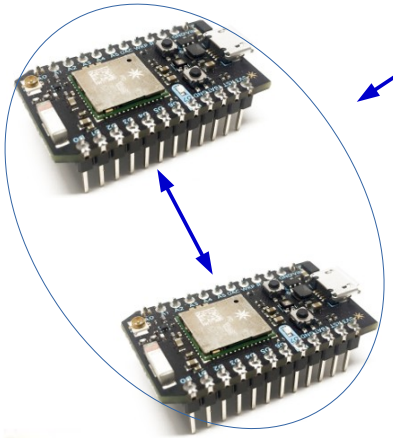
Slides available at:
http://aposteriori.com.sg/other_resources

Learning More

Lego EV3 robots

Particle Electron
(3G connection)

Raspberry Pi
(Higher processing power)



Webpages /
Progress Web Apps

Learning More

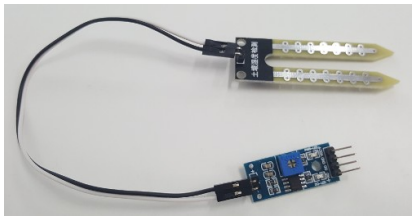
LED Strips

Servo Motors

Stepper Motors

RFID Readers

Ultrasonic
Distance Sensor



Temperature and
Humidity

Camera
(for image recognition
or QR Codes)

Wheeled motors
(for robots)

Gyro and
acceleration

Laser Distance
Sensor

Copyright

- Created by A Posteriori LLP
- Visit http://aposteriori.com.sg/ for more tips and tutorials
- This work is licensed under a Creative Commons Attribution-ShareAlike 4.0 International License.